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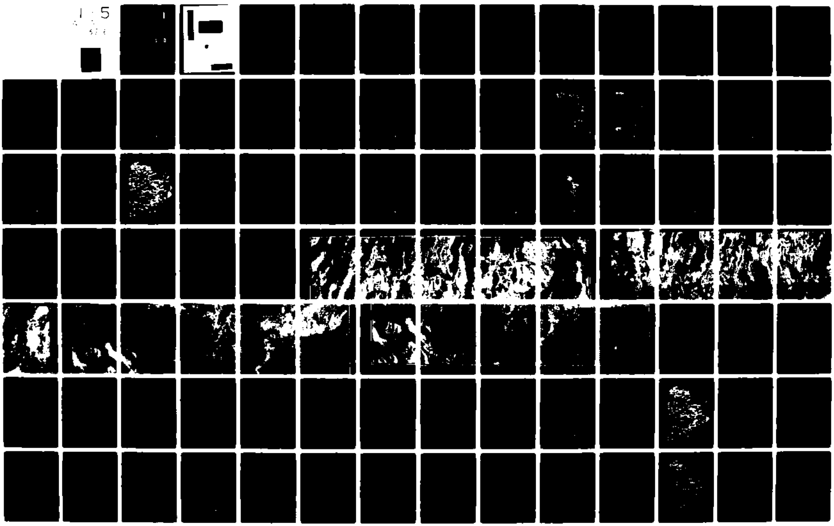

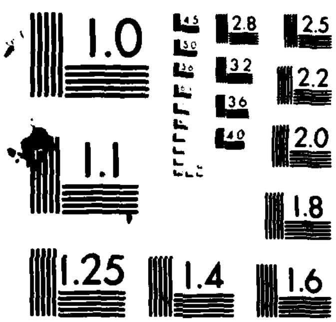

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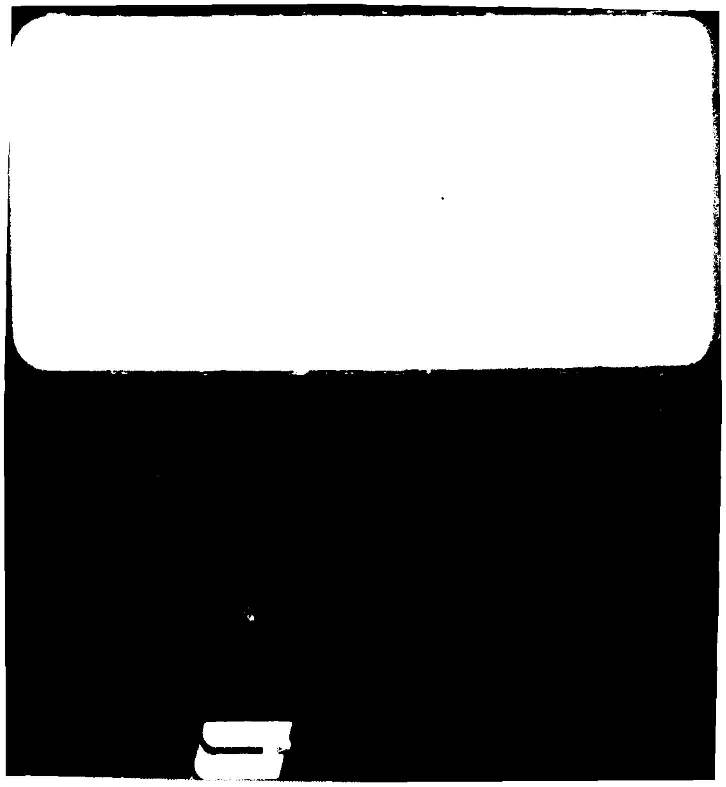

MX SYSTEM SITING
SUMMARY REPORT

GENERAL INTRODUCTION
VOLUME I, PART I

Prepared for:

U.S. Department of the Air Force
Ballistic Missile Office
Norton Air Force Base, California 92409

Prepared by:

Ertec Western, Inc.
3777 Long Beach Boulevard
Long Beach, California 90807

18 January 1982

Ertec

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Results of MX system siting study in Nevada and Utah are summarized on 8 regional system maps. The shelter layouts depicted are based on 23/1 clustering, 5200 foot spacing. There are 232 clusters representing the potential alternatives in selecting an optimum 200 cluster system

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FOREWORD

This report has been prepared for the U.S. Department of the Air Force, Ballistic Missile Office, in compliance with Contract No. F04704-80-C-0006. It presents the summary of Ertec Western's investigations for siting of facilities and routing of a transportation network for the MX system in Nevada, Utah, and New Mexico. Information, results, and conclusions contained in this report are based on MX siting studies conducted during fiscal years 1980 and 1981. The major part of the study covers 37 deployment valleys and three main operating base sites in Nevada and Utah. Limited studies were also performed in the area surrounding the main operating base site in New Mexico. This report consists of three volumes.

Volume I, Part I

- General Introduction providing brief overviews of the MX system, program schedule, and siting program which includes:
  - Introduction
  - Summary of MX System Components
  - MX Program Schedule Overview
  - Siting Program Overview

Volume I, Part II

- Summary discussions of results, conclusions, and recommendations of the Shelter Siting Summary studies of the 37 deployment valleys which includes:
  - Introduction
  - Siting Requirements
  - Siting Methodology
  - MPS/HSS Siting Program, Nevada/Utah DDA
  - Shelter Siting Program Summary, Conclusions, and Recommendations

Volume II, Part I

- Results and conclusions of the Designated Transportation Network/Area Support Centers (DTN/ASC) siting studies within the MX system study areas which includes:
  - Introduction
  - Objective and Scope
  - Methodology
  - Criteria
  - Field Reconnaissance and Pass Evaluation
  - Evaluation of Optimum DTN Routings and ASC Locations
  - Conclusions

Volume II, Part II

- o Results and conclusions of the Operational Base Test Site/ Designated Training Area (OBTS/DTA) siting studies near the main operating base sites in Nevada-Utah and New Mexico which includes:

  - Introduction
  - Siting Requirements
  - Methodology
  - OBTS/DTA Siting Evaluation
  - Conclusions

Volume III

- o Land Acquisition Application Package Map Sheets depicting the various preferred and alternate facility combinations for land parcel acquisition which includes:

  - Introduction

This report was being prepared prior to the President's decision on 2 October 1981 not to proceed with the MPS MX basing option. It was intended that more detailed valley siting reports would follow this general evaluation. The original objective of the report was to provide interim data to the users of MX siting data until these more detailed evaluations could be produced. As a result of the President's decision, this report represents the final summary of the MX system siting in the MPS basing mode.

It should be noted that at the beginning of FY 81, siting studies were performed under the firm name of Fugro National, Inc. at its Long Beach offices. On 25 March 1981, the corporate name was changed to The Earth Technology Corporation - Ertec. Since that date, the siting studies have been performed at the same offices under the name of Ertec Western, Inc. with support from Ertec Northwest, Inc., Seattle, Washington; Ertec Airborne Systems, Inc., Cypress, California; and Ertec Rocky Mountain, Inc., Denver, Colorado.

LIST OF ACRONYMS

ADT	Average Daily Traffic
AFRCE-MX	Air Force Regional Civil Engineer-MX
AFSC	Air Force System Command
ALCC	Airborne Launch Control Center
AOB	Auxiliary Operating Base
ASC	Area Support Center
BLM	Bureau of Land Management
BMO	Ballistic Missile Office
C^3	Command, Control, and Communication
CBR	California Bearing Ratio
CDP	Candidate Deployment Parcel
CEQ	Council on Environmental Quality
CMF	Cluster Maintenance Facility
COE	U. S. Department of the Army, Corps of Engineers
CONUS	Conterminous United States
CPT	Cone Penetrometer Test
CRN	Cluster Road Network
CSR	Candidate Siting Region
DAA	Designated Assembly Area
DDA	Designated Deployment Area
DEIS	Draft Environmental Impact Statement
DMA	Defense Mapping Agency
DOPAA	Description of Proposed Actions and Alternatives
DTA	Designated Training Area
DTN	Designated Transportation Network
EIS	Environmental Impact Statement
FLPMA	Federal Land Policy Management Act
FNI	Fugro National, Inc.
FSED	Full Scale Engineering Development
FY	Fiscal Year
GBNP	Great Basin National Park
HDR	Henningson, Durham, & Richardson, Inc.
HSS	Horizontal Shelter Site
IOC	Initial Operational Capability
KGRA	Known Geothermal Resources Area
MF	Medium Frequency
MMC	Martin Marietta Company
MOA	Military Overflight Area
MOB	Main Operating Base
MPS	Multiple Protective Structure
MPT	Mobile Patrol Teams
NCA	National Control Authorities
NEPA	National Environmental Policy Act
NH&S	Nuclear Hardness and Survivability
OB	Operational Base
OBTS	Operational Base Test Site

OSR	Operational Support Road
PLU	Preservation of Location Uncertainty
PMOA	Programmetric Memorandum of Agreement
POL	Petroleum, Oils, and Lubricants
PS	Protective Structure
QA	Quality Assurance
QD	Quantity Distance
R&D	Research and Development
REPR	Real Estate Planning Report
RES	Renewable Energy Sources
RMP	Ralph M. Parsons Company
ROW	Right-of-way
RSS	Remote Surveillance Site
SAC	Strategic Air Command
SALT	Strategic Arms Limitation Talks
SHPO	State Historic Preservation Officer
STV	Special Transport Vehicle
T&E	Threatened and Endangered
TEL	Transporter and Erector Launcher
TI	Technical Interchange
TSB	Test Support Building
USGS	United States Geological Survey
USPLS	United States Public Land Survey
UTM	Universal Transverse Mercator
V&H	Vulnerability and Hardness

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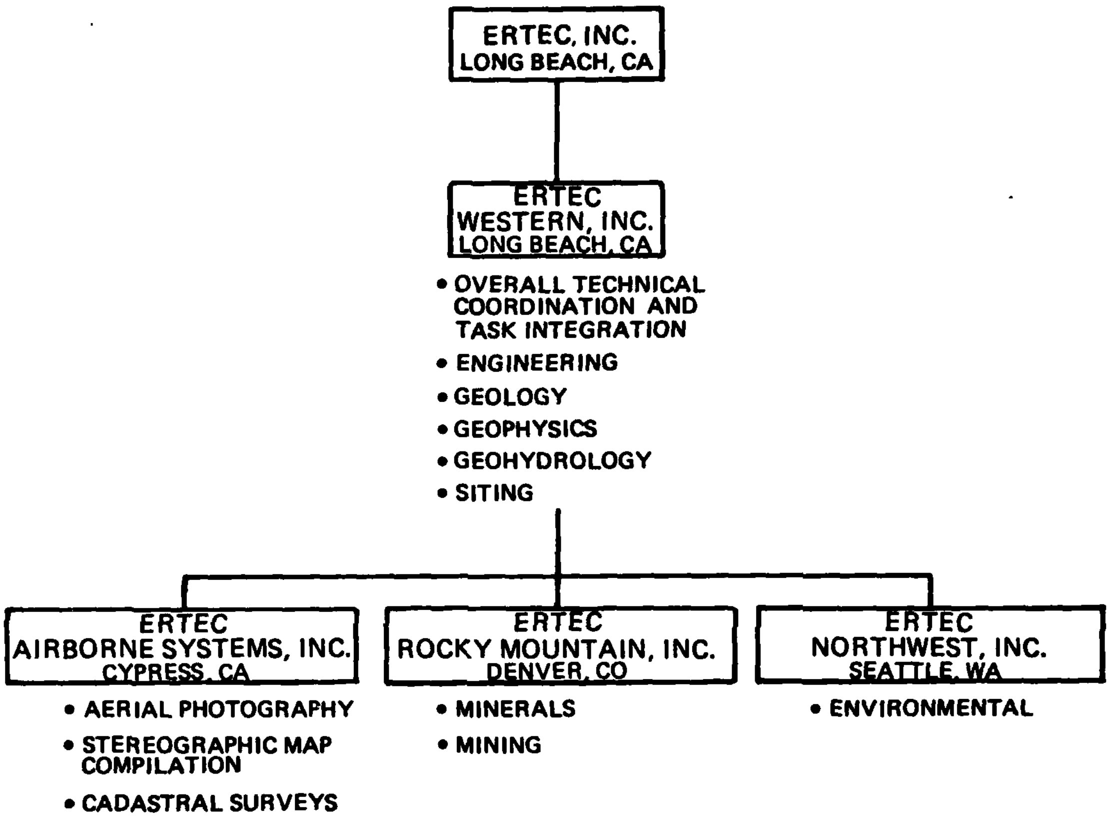
1.0 INTRODUCTION

This report (Volume I, Part I and Part II; Volume II, Part I and Part II; and Volume III) documents the siting activities of Ertec Western, Inc. (Ertec), the geotechnical and siting contractor for the Air Force on the MX project. Brief overviews of the MX system, program schedule, and siting program will be presented in this general introduction. The remainder of the report consists of the following:

- Volume I Part II - Shelter Siting Summary
- Volume II Part I - Designated Transportation Network/ Area Support Center Siting
- Volume II Part II - Operational Base Test Site/Designated Training Area Siting
- Volume III - Land Acquisition Application Package Map Sheets

The Ertec siting program was performed by an integrated multidisciplinary group of professionals. Figure 1-1 is a general representation of the Ertec offices and technical disciplines which participated in the MX siting program. These groups conducted various office and field studies. Office studies consisted of literature searches/reviews, analyses of field data, and aerial photo interpretation. Field studies included reconnaissance trips as well as various geotechnical and environmental sampling surveys and measurements.

Early MX siting studies involved screening and site characterization studies to identify candidate regions within the United States where the MX system could be deployed. Subsequently, more detailed siting studies were performed to delimit



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PARTICIPATING ERTEC OFFICES IN THE MX SITING PROGRAM

30 NOV 81

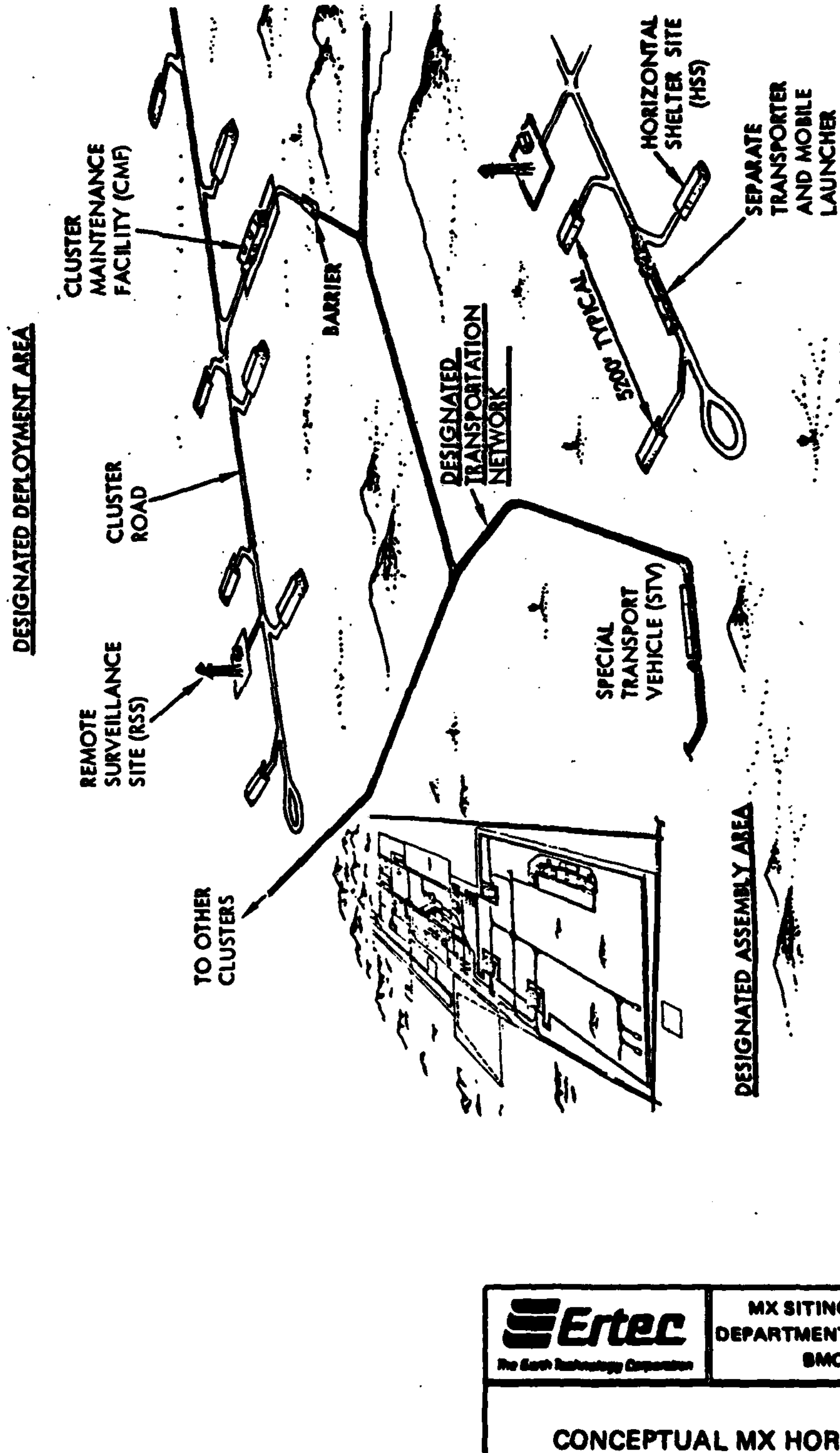
FIGURE 1-1

more precisely the land area to be involved in the construction and deployment of the system, produce conceptual layouts of the facilities, provide input to the decision-making process (tiering), and to identify and describe the land parcels to be included in the land acquisition application. Ertec's siting studies were restricted for the most part to the proposed Nevada-Utah MX siting area. Limited activities were performed in New Mexico.

2.0 SUMMARY OF MX SYSTEM COMPONENTS

The baseline MX system consists of 200 missiles to be deployed in 4600 protective structures (i.e., shelters) within a Designated Deployment Area (DDA) (Figure 2-1). The MX missile will be about 7.7 feet (2.3 m) in diameter, 73 feet (22 m) in length, and not to exceed 196,000 pounds (8890 kg). Each missile is located in a cluster of 23 Horizontal Shelter Sites (HSSs). The area of the HSS is approximately 2 1/2 acres (1 hectare), fenced in a dodecagon shape, and contains the 171.2 foot (52.1 m) long protective structure covered with 5 feet (2 m) of earth. Other cluster-related facilities are the Cluster Road Network (CRN) to connect all shelters in a cluster, the Cluster Maintenance Facility (CMF) for routine maintenance of the missile, the separate Transporter and Erector Launcher (TEL), and a barrier separating the CRN and the Designated Transportation Network (DTN) road to restrict the entry/exit of the TEL to a cluster. Initially, the Remote Surveillance Site (RSS) was part of the MX system and was included in layout and field studies. RSSs were deleted on 7 January 1981 (U.S. Department of the Air Force, BMO/AFRCE-MX, 1981).

The DTN road serves to connect all clusters in the DDA to the Main Operating Base (MOB), the Designated Assembly Area (DAA), the Auxiliary Operating Base (AOB), Operational Base Test Site (OBTS), Designated Training Area (DTA), and Area Support Centers (ASCs). The DTN is the main MX road system and must be designed to support the special transport vehicle which delivers the missiles from the MOB/DAA to the clusters.



REFERRENCE:
UNITED STATES DEPARTMENT OF THE AIR FORCE, BMO/AFSC, 1980

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CONCEPTUAL MX HORIZONTAL SHELTER BASING

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FIGURE 2-1

Physical security is maintained by mobile patrol teams operating out of and supported by helicopter patrols from the ASCs. The ASCs also provide system service support. A network of security and support roads interconnect the clusters, but these roads are not capable of supporting the TEL.

Command, control, and communication (C^3) is achieved via buried fiber optic cables throughout the system and buried medium frequency antennas at each shelter. A post-attack C^3 link to National Control Authorities is provided through an Airborne Launch Control Center operating adjacent to the DDA. The ALCC could be based at the MOB or AOB.

Electrical power is obtained by tying into the commercial power grid or by developing alternate sources of power. Auxiliary power will also be available via backup generators at the clusters (U.S. Department of the Air Force, BMO/AFSC, 1980).

3.0 MX PROGRAM SCHEDULE OVERVIEW

In Fiscal Year 1978 (FY 78), the MX program entered full-scale engineering development (FSED). At that time, the leading basing mode was vertical shelters. A decision to proceed with FSED of the missile was announced in June 1979. By August 1979, the basing mode switched from vertical to horizontal shelters. A decision to base the missiles in a sheltered road-mobile system in the southwestern United States was made in September 1979.

The overall program schedule was briefly described in U.S. Air Force Fact Sheet 80-A (no date):

> "To meet the Initial Operational Capability (IOC) date of mid-1986, the Air Force plans to begin construction of roads and utilities in early 1982. (IOC is that time when 10 missiles, with 230 shelters, will be on alert)."
>
> "The FSED phase of the MX program leads to the decision whether or not to deploy the full 200 missiles MX system. The production decision is expected to be made in mid-1983. Most of the facility construction will not begin until after the production decision, with the construction of the shelters to begin in early 1984. Current plans are for all 200 missiles, in 4600 shelters, to be on alert in 1989."

4.0 SITING PROGRAM OVERVIEW

Ertec has been involved in numerous studies related to siting the MX system. Figure 4-1 shows the relative time frame between the earlier siting-related studies and the current siting efforts.

4.1 STUDIES PRIOR TO FY 80

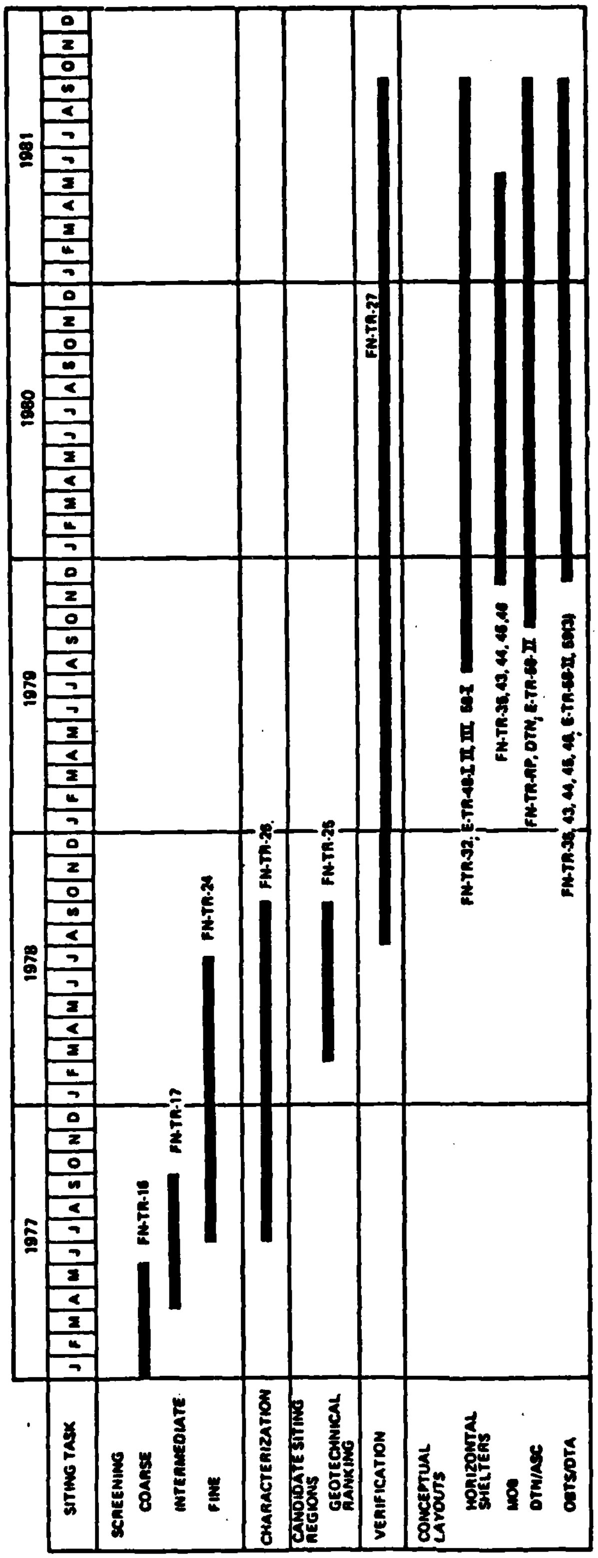
The studies conducted by Ertec involved geotechnical evaluations covering the conterminous United States. Gradually the study area was reduced in size and the studies became more specific in scope. A brief description of the studies listed in Figure 4-1 is presented below.

4.1.1 Screening Studies

Three levels of screening studies were conducted to identify areas within the conterminous United States in which to base the MX system (Fugro National, Inc. 1977ab, 1978f). Each succeeding study continued from its predecessor and was more detailed in nature and scope.

4.1.1.1 Coarse Screening

The criteria of this effort were essentially exclusionary. Area was eliminated on the basis of proximity to large cities, cultural or environmental considerations, slopes greater than 10 percent, and ground water and bedrock at the surface or within 50 feet (15 m) of the ground surface. Areas smaller than 660 mi^2 (1709 km^2), as identified by applying the aforementioned criteria, were deemed unsuitable for siting the MX system.



NOTES:
1. FOR PRIOR GEOTECHNICAL STUDIES RELATING TO POOL, 16NM TRENCH, AND SHELTER BASING MODES SEE REPORT FN-TR-6, 31 OCTOBER 1976.
2. FOR A COMPLETE LIST OF TECHNICAL REPORTS, REFER TO APPENDIX A OF THE 1981 EXECUTIVE SUMMARY REPORT (E-TR-58).
3. AS DIRECTED BY A STOP WORK ORDER, THIS REPORT WAS NOT COMPLETED.

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SUMMARY SCHEDULE OF
MAJOR ERTEC SITING TASKS

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FIGURE 4-1

Approximately 65 percent of the conterminous United States was determined not to meet the above criteria. About 35 percent (i.e., the remaining 1,050,000 mi^2 [2,719,487 km^2] of the conterminous United States) appeared highly suitable. Most of the area is within the Basin and Range, Great Plains, and Central Lowland physiographic provinces.

4.1.1.2 Intermediate Screening

Suitable areas identified in coarse screening were divided into two study areas. Ertec performed studies in the western United States and the Defense Mapping Agency (DMA) did the same in the eastern United States. Suitable area identified in the studies totalled appoximately 150,000 mi^2 (388,498 km^2) all of which was in the western United States. This suitable area consisted of 85 percent suitable soil while the remainder was excavatable rock.

4.1.1.3 Fine Screening

Fine screening was conducted in an area extending from the Basin and Range province, across the southwest border states and up to North Dakota. This study was performed in a U.S. Air Force determined 110,000 mi^2 (284,900 km^2) portion of the intermediate screening suitable area. The study evaluated cultural considerations which, if applied, would reduce the area of suitability from 110,000 mi^2 (284,900 km^2) to about 75,000 mi^2 (194,250 km^2).

4.1.2 Characterization Studies

The results of the screening studies were further refined through the development of geotechnical data obtained in field studies. Twenty-five primary and supplemental sites within geotechnically similar areas were delineated and the geotechnical field studies were performed (Figure 4-2), (Fugro National, Inc., 1978b, c, d, e, and g). The objective of these studies was to collect geotechnical data to be used in a comparative ranking assessment for determining preferred areas based on geotechnical and construction considerations.

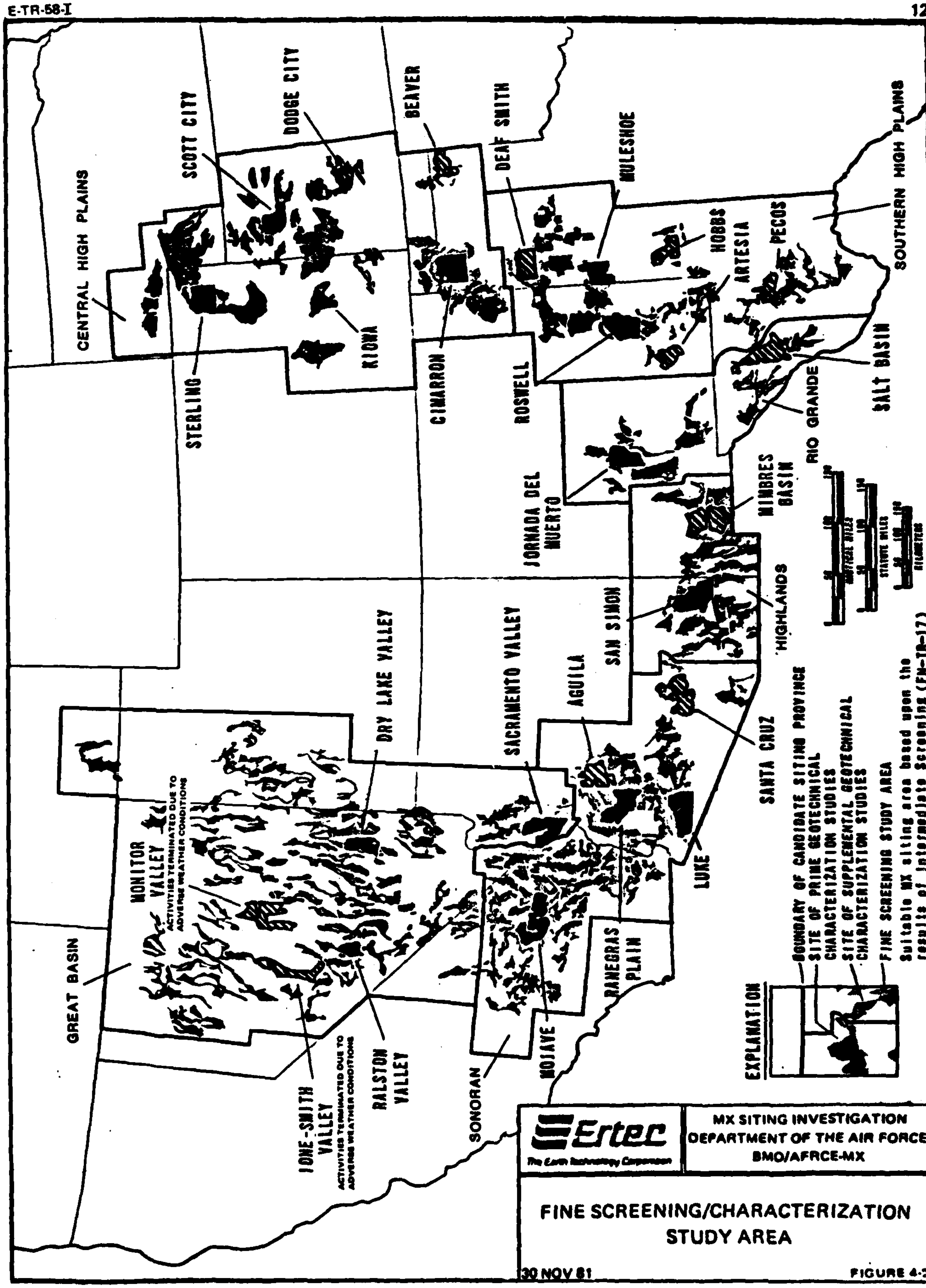
4.1.3 Geotechnical Ranking of Candidate Siting Regions

After the field work for the characterization program had been completed, a geotechnical ranking study was initiated. A decision analysis methodology was devised using a probabilistic approach to determine a relative cost ranking for seven Candidate Siting Regions (CSRs), (Fugro National, Inc., 1978a). The CSRs consisted of suitable area defined from the fine screening, and each CSR was determined by the following process:

- o Aggregations of suitable area larger than 1000 square nautical miles (nm^2) (1326 mi^2, 3400 km^2) not bisected by interstate and U.S. highways, major streams, or major culture features;
- o Combinations of aggregates, in close proximity, to form core CSRs; and
- o Additions of smaller area aggregates to reach CSR total area required for each basing mode.

The CSRs determined by the process are shown in Figure 4-3 and are identified by the letters A through G. The relative cost ranking was limited to geotechnically related construction items for the in-line hybrid trench, hard vertical shelter, and loading dock horizontal shelter basing modes. The results of the study indicated that:

- o The ranking changes for each basing mode;



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FINE SCREENING/CHARACTERIZATION STUDY AREA

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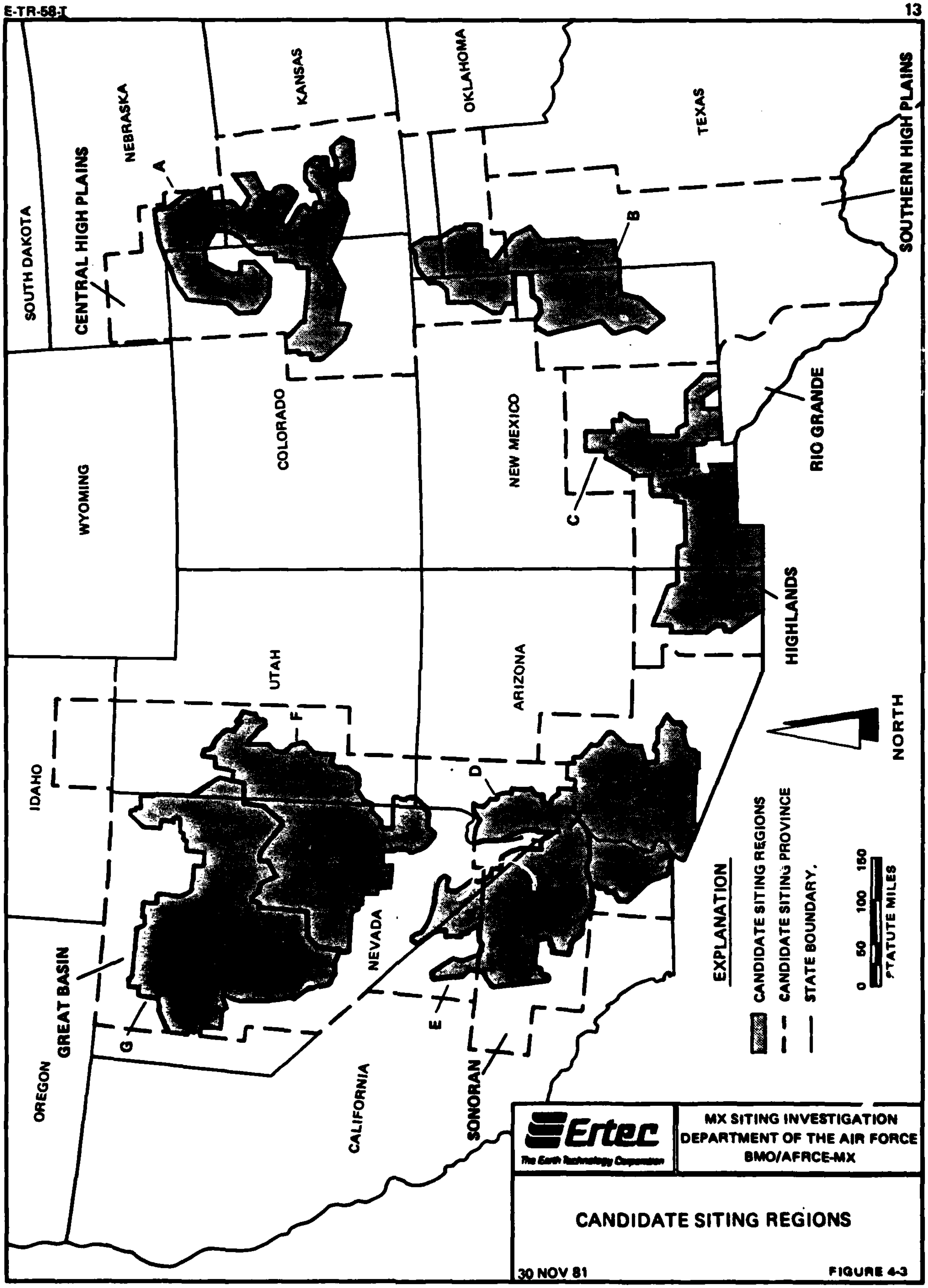
FIGURE 4-2



CANDIDATE SITING REGIONS

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FIGURE 4-3

- For either shelter basing mode, the relative ranking of five of the CSRs (including Nevada-Utah Deployment Area) was within a fairly close range and a final decision on site selection would be based on nongeotechnical factors; and

- For either shelter basing mode, road costs are a major factor affecting ranking. Because of the costs, extensive studies on routing and design of roads should be considered.

4.1.4 Verification Studies

The Verification studies phase of the site-selection process began in 1978 and was performed in Nevada, Utah, and Arizona (Fugro National, Inc., 1979a and b). The objectives of the Verification program were to:

- Verify and refine suitable area boundaries for horizontal and vertical shelter basing modes; and

- Provide preliminary physical and engineerng soils characteristics.

The determination of suitable area was based on the exclusion criteria summarized in Table 4-1. The techniques used to apply the criteria to refine suitable area boundaries are as follows:

- Depth to rock - 50- and 150-foot (15- and 46-m) contours were constructed based on interpretation from published well data, geologic mapping, boring logs, and geophysical data;

- Depth to water - 50- and 150-foot (15- and 46-m) contours were constructed using data from the Ertec Water Resources program wells, existing well data, and literature (for these studies, the depth to water represents the depth to first encountered water, not static water level);

- Adverse terrain - areas were excluded by applying slope and drainage information from examination of aerial photographs (1:60,000 scale black-and-white and 1:25,000 scale color photography), review of topographic maps, and field data; and

- Geographical impacts - sensitive land use areas were excluded by applying land status information derived from mineral surveys, detailed topographic maps, BLM master title plats, and U.S. Army, Corps of Engineers (COE) Real Estate Planning Reports (U.S. Department of the Army, Corps of Engineers, 1980).

CRITERIA		DEFINITION AND COMMENTS
SURFACE ROCK AND ROCK OCCURRING WITHIN 50 FEET (15 m) AND 150 FEET (46 m) OF THE GROUND SURFACE		*Rock is defined as any earth material which is not rippable* by conventional excavation methods. Where available, seismic P-wave velocities were evaluated in the determination of rock conditions.
SURFACE WATER AND GROUND WATER OCCURRING WITHIN 50 FEET (15 m) AND 150 FEET (46 m) OF THE GROUND SURFACE		Surface water includes all significant lakes, reservoirs, swamps, and major perennial streams. Water which would be ecountered in a 50-foot and 150-foot excavation was considered *in the application of this criterion. Depths to ground water resulting from deeper confined aquifers were not considered.*
ADVERSE TERRAIN	Percent Grade	Areas having surface gradients exceeding 10 percent or a preponderance of slopes exceeding 10 percent as determined from maps at scales of 1:125,000, 1:62,500, and 1:24,000 and by field observation.
	Drainage	Areas averaging two or more 10-foot deep drainages per 1000 feet.
GEOGRAPHICAL IMPACTS	Land Use	All significant federal and state forests, parks, monuments, and recreational areas. All significant federal and wildlife refuges, grasslands, ranges, preserves, and management areas. Indian reservations.

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EXCLUSION CRITERIA
VERIFICATION STUDIES, NEVADA–UTAH

30 NOV 81 TABLE 4-1

Th. study of basin-fill materials was undertaken to obtain the engineering properties of the soils for preliminary design considerations regarding road construction and shelter excavation. These studies included field sampling, laboratory testing, and data analyses. Table 4-2 summarizes the geological/geophysical field activities and the engineering field and laboratory tests. These activities are representative of those conducted in the valleys of the Nevada/Utah DDA.

4.2 SITING STUDIES

Siting studies conducted by Ertec were primarily directed toward identifying geotechnical, environmental, geographical conditions important for locating the shelters/clusters, DTN, ASCs, and OBTS/DTA. Preliminary siting studies of the MOB/AOB were performed prior to the more detailed studies by the Base Comprehensive Planner (EDAW, Inc.). In order to site these MX facilities, three specific functions were to be completed:

- Conceptual layout development;
- Tiered decision-making process support; and
- Land acquisition application support.

4.2.1 Study Area

The proposed Nevada/Utah DDA is located in the Great Basin section of the Basin and Range physiographic subprovince, in central Nevada and west central Utah. The physiography is controlled by north-south trending, elongated mountain ranges separated by alluviated valleys.

GEOLOGY AND GEOPHYSICS–FIELD ACTIVITIES

TYPE OF ACTIVITY	AVERAGE NUMBER OF ACTIVITIES
Geologic mapping stations	100
Water table monitoring wells	7
Shallow refraction	20
Electrical resistivity	20

ENGINEERING–FIELD ACTIVITIES

ACTIVITY	AVG. NO.	NOMINAL DEPTH - FEET (METERS)
Borings	8	160 (49)
Trenches	13	9-14 (3-4)
Test pits	25	5 (2)
Surficial soil samples	35	2-3 (0.6-1)
CPT soundings	70	0.2-75 (0.1-23)
Field CBR tests	3	1-3 (0.3-1)

ENGINEERING–LABORATORY TESTS

TYPE OF TEST	AVERAGE NUMBER OF TESTS
Moisture/density	130
Specific gravity	7
Sieve analysis	190
Hydrometer	3
Atterberg limits	20
Consolidation	2
Unconfined compression	4
Triaxial compression	3
Direct shear	10
Compaction	15
CBR	15
Chemical analysis	12

NOTES:

1. A TYPICAL VERIFICATION VALLEY CONTAINS 283 SQUARE MILES OF GEOTECHNICALLY SUITABLE AREA
2. THE ACTUAL NUMBER OF ACTIVITIES OR TESTS TO BE PERFORMED FOR A VALLEY WERE DETERMINED BY THE GEOTECHNICAL DISCIPLINE GROUPS AFTER REVIEWING EXISTING DATA SOURCES

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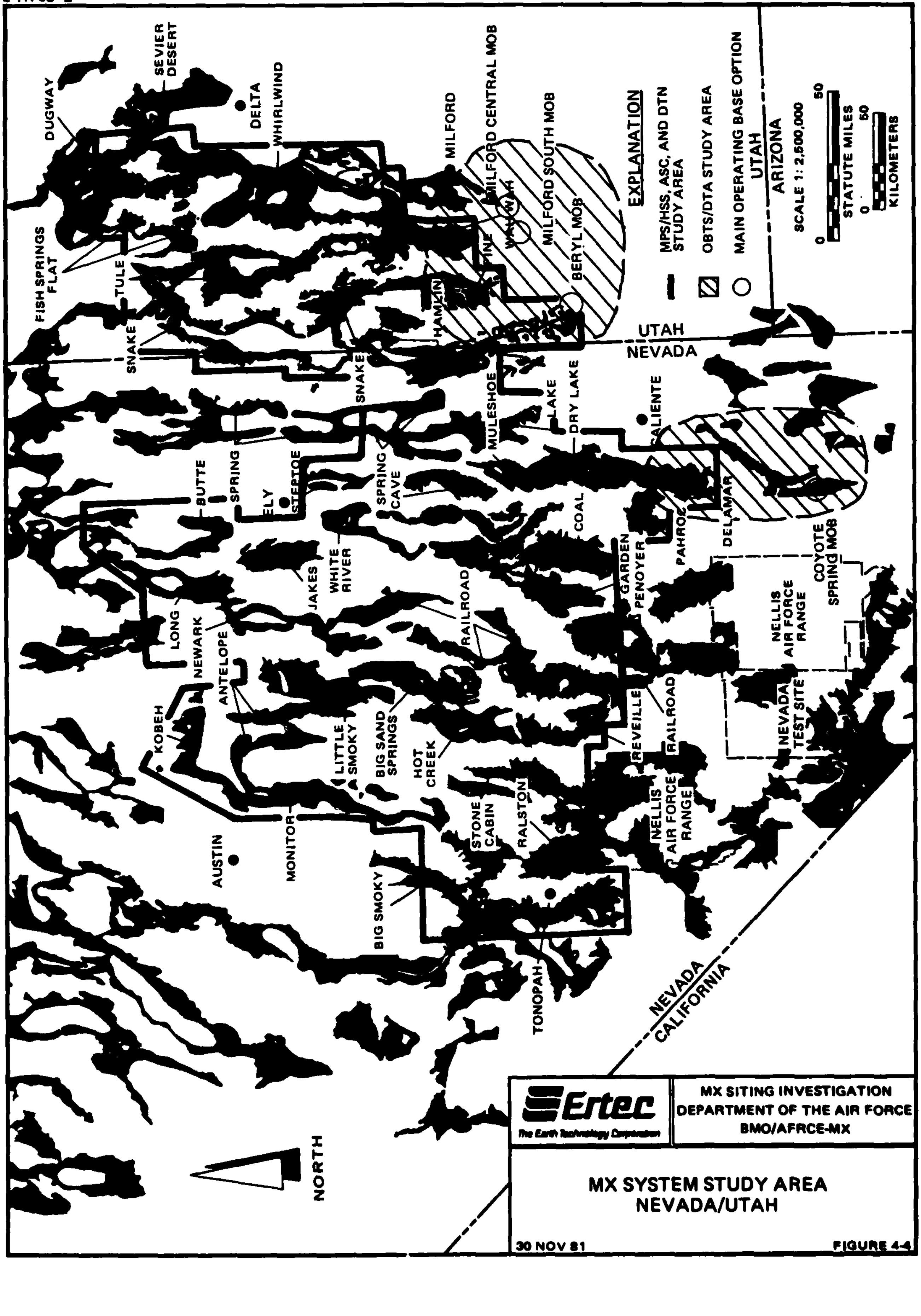
FIELD ACTIVITIES WITHIN A TYPICAL VERIFICATION VALLEY

30 NOV 81 TABLE 4-2

The valleys in the study areas in Nevada-Utah (Figure 4-4) average between 50 and 100 miles (80 and 161 km) in length and between 5 and 15 miles (8 and 24 km) in width. Mountain pass elevations generally range between 4600 and 7500 feet (1402 and 2286 m) above sea level. The highest peak in the area is Wheeler Peak at an elevation of 13,070 feet (3984 m). Valley floor elevations range from 2300 to 7600 feet (701 to 2316 m) in the DDA.

The geology of the area is dominated by sedimentary and igneous rocks ranging in age from Precambrian to Quaternary and by unconsolidated sediments of Quaternary age. The mountain ranges are eroded remnants of uplifted fault blocks separated by down-dropped basins. Almost all the valleys are closed basins with gently sloping alluvial surfaces grading toward a central playa. Playas, dunes, and alluvial fans are common landforms in the valleys. The low annual rainfall accounts for the paucity of perennial streams, rivers, and lakes. Vegetation consists of sage and low brush on the valley floors with cottonwoods, junipers, and pinon pines occurring where precipitation is more plentiful.

The population in the DDA is sparse; Ely, Nevada, is the largest community with a population of about 5626 (White Pine Chamber of Commerce). Many small communities also exist within the DDA and are connected by a network of interstate, federal, and state highways and county dirt roads (both improved and unimproved).


EXPLANATION
MPS/HSS, ASC, AND DTN STUDY AREA
OBTS/DTA STUDY AREA
MAIN OPERATING BASE OPTION
UTAH
ARIZONA
SCALE 1: 2,500,000
STATUTE MILES
KILOMETERS
0
50
UTAH
NEVADA
NEVADA
CALIFORNIA
NORTH
DUGWAY
SEVIER DESERT
DELTA
WHIRLWIND
MILFORD
MILFORD CENTRAL MOB
MILFORD SOUTH MOB
BERYL MOB
WAH WAH
PINE
HAMLIN
FISH SPRINGS FLAT
TULE
SNAKE
SNAKE
MULESHOE
LAKE
DRY LAKE
CALIENTE
BUTTE
SPRING
ELY
STEPTOE
SPRING CAVE
COAL
DELAMAR
PAHROC
GARDEN
PENOYER
COYOTE SPRING MOB
JAKES
WHITE RIVER
RAILROAD
LONG
NEWARK
ANTELOPE
NELLIS AIR FORCE RANGE
KOBEH
LITTLE SMOKY
BIG SAND SPRINGS
HOT CREEK
REVEILLE
RAILROAD
NEVADA TEST SITE
STONE CABIN
RALSTON
NELLIS AIR FORCE RANGE
AUSTIN
MONITOR
BIG SMOKY
TONOPAH
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DEPARTMENT OF THE AIR FORCE
BMO/AFRCE-MX
MX SYSTEM STUDY AREA
NEVADA/UTAH
30 NOV 81
FIGURE 4-4

The study area for the OBTS/DTA in New Mexico is an annular zone around the Cannon Air Force Base (AFB) MOB option which is located 8 miles (12 km) west of Clovis, New Mexico. In order to establish a preferred IOC location prior to OBTS/DTA site selection, the outer limits of the study area included parcels up to 80 miles (129 km) from Cannon AFB.

4.2.2 Conceptual Layout Development

The development of conceptual layouts was undertaken as a means of visualizing and analyzing MX system components, individually and collectively. These layouts, predicated on office and field data, consisted of map studies which simulate the geographical position of the MX facilities within the DDA and MOB vicinity zones. Subsequent field studies and surveys were conducted to assess the adequacy of the siting procedures and to provide feedback in refining the siting methodology. The purpose of the conceptual layouts was to serve as a basic system model for input to a tiered decision-making process. The model system would be studied to develop and refine siting methodologies and to detect and identify problems and conflicts. The conceptual layouts were compiled by Ertec within areas determined to be geotechnically suitable for siting. These areas were further refined by geographical/environmental considerations to delimit the actual areas used to develop the conceptual layouts. The layouts and the boundary of the siting area were depicted as line drawings on 1:62,500 scale topographic base maps. Data used to define the siting area were compiled as map overlays at 1:62,500 scale from previous geotechnical studies, numerous published sources, and concurrent field studies.

4.2.3 Tiered Decision-Making Process Support

Tiering is the terminology applied to a decision-making process used by the President's Council on Environmental Quality in its; 1978 "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act":

> "Tiering" refers to the coverage of general matters in broader environmental impact statements (such as national program or policy statements) with subsequent narrower statements or environmental analyses (such as regional or basin wide program statements or ultimately site-specific statements) incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared."

In Tier I, a generalized system model was used to assess area requirements and to select a region of the United States in which to base the MX system. Tier II was to continue from that point and deal with siting decisions of MX system components within the selected region. The components were the MOB, OBTS, DTA, IOC, and associated right-of-way alignments.

The Tier II process was further subdivided into smaller units (i.e., a, b, c) in order to show consideration for the functional relationships between the MX system components. In terms of the operational schedule, only certain key facilities of any particular component were needed as basic building blocks at any one time. As a result, siting decisions could be further phased as well as subdivided. An example of this is presented in Table 4-3. It becomes apparent from this process that construction is sequential and incremental. Certain facilities of the MOB/DAA are constructed first, but the entire MOB/DAA is not necessarily completed prior to starting construction on other system components.

The tiering approach, with its phased decision making, has been employed by other agencies and organizations when conforming to the requirements of the National Environmental Policy Act. The conceptual layouts serve as basic input to this decision-making process.

4.2.4 Land Acquisition Application Support

Siting the MX system in the Nevada/Utah DDA required conformance to the 1976 Federal Land Policy Management Act (FLPMA) and the 1958 Engle Act (TRW, 1980). The majority of land available for siting the system is subject to the requirements of FLPMA. The Engle Act imposes additional conditions for the withdrawal of federal public lands for military purposes. Both acts specify that land applications involving more than 5000 acres (2007 hectares) must be accompanied by maps. The Department of Interior, Bureau of Land Management (BLM) becomes a focal point as both acts indicate that this agency will review the application and investigate the existing or potential demand for the lands or their resources. The BLM is commissioned to adjust the application (with the applicant) to reduce the area required to a minimum.

TIER II A	TIER II B	TIER II C
• MOB/DAA SUBSYSTEMS	• MOB/DAA SUBSYSTEMS	
• OBTS/DTA SUBSYSTEMS	• OBTS/DTA SUBSYSTEMS[1]	
• ROW ALIGNMENTS – MOB/DAA – OBTS/DTA	• ROW ALIGNMENTS – MOB/DAA TO IOC VALLEYS	• ROW ALIGNMENTS – IOC VALLEYS
	• IOC VALLEY SUBSYSTEMS	• IOC VALLEY[1] SUBSYSTEMS
		• ROW ALIGNMENTS – FOLLOW-ON VALLEYS
		• FOLLOW-ON VALLEY SUBSYSTEMS

NOTE:
1. CONTINUATION OF SUBSYSTEM SITING WHICH BEGAN IN PREVIOUS TIER

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GENERALIZED EXAMPLE OF
TIER II SUBDIVISION

30 NOV 81 TABLE 4-3

For the MX program, Ertec was to coordinate the display of siting contractor data onto maps accompanied by land parcel descriptions referenced to the U.S. Public Land Survey system. No specific format is defined by FLPMA or the Engle Act. Table 4-4 list general topics to be covered in the application. These items would be delivered to the AFRCE-MX who would then coordinate with the COE to submit the land acquisition application to BLM and eventually to Congress.

The Land Acquisition Package consisted of the following elements:

- o A regional map at a scale 1:500,000 showing the system layout, (similar to Drawing 4-1);
- o Base maps at a scale of 1:62,500 depicting shelter sites, cluster roads, DTN routes, ASC sites, MOB and OBTS/DTA site options, borrow areas, utility corridor, access roads, etc.; and
- o Land parcel descriptions of all facilities (legal descriptions).

The base maps consisted of a series of standard "E" size maps which covered the entire Nevada/Utah deployment area. A grid was developed as shown in Figure 4-5; it consisted of 62 map sheets. Seventeen of these were used in the initial Land Acquisition Package, and the remaining map sheets were in various stages of development at the end of FY 81.

The first increment of the land acquisition application consisted of various combinations of the preferred and alternate MOB/DAA, OBTS/DTA, IOC valley facilities options and other associated right-of-way alignments. EDAW submitted drawings

REQUIREMENT	FEDERAL ACTS	
	FLPMA	ENGLE
THE NAME AND ADDRESS OF THE APPLICANT AGENCY AND INTENDED USING AGENCY.	●	●
LEGAL DESCRIPTION OF THE LANDS DESIRED, IN TERMS OF PUBLIC LAND SURVEY. ALSO TO INCLUDE A DETAILED DESCRIPTION OF THE EXTERIOR BOUNDARIES AND EXCEPTED AREAS WITHIN THE WITHDRAWAL AREA.	●	●
GROSS LAND AND WATER ACREAGE WITHIN THE EXTERIOR BOUNDARIES OF THE REQUESTED WITHDRAWAL, AND NET PUBLIC LAND, WATER, OR PUBLIC LAND AND WATER ACREAGE COVERED BY THE APPLICATION.	●	●
THE PURPOSE OR PURPOSES OF THE PROPOSED LAND WITHDRAWAL AREA. IF THE PURPOSE IS CLASSIFIED FOR NATIONAL SECURITY REASONS, A STATEMENT TO THAT EFFECT IS REQUIRED.	●	●
STATE WHETHER THE PROPOSED USE WILL RESULT IN CONTAMINATION OF THE REQUESTED AREA, AND IF SO, STATE WHETHER IT WILL BE OF A TEMPORARY OR PERMANENT NATURE.	●	●
THE ESTIMATED PERIOD DURING WHICH THE PROPOSED WITHDRAWAL WILL CONTINUE IN EFFECT.	●	●
THE EXTENT THE PROPOSED USE WILL AFFECT CONTINUING FULL OPERATION OF PUBLIC LAND LAWS AND FEDERAL REGULATIONS RELATING TO ENVIRONMENTAL AND RESOURCE CONCERNS.	●	●
STATE WHETHER THE PROPOSED WITHDRAWAL WILL INVOLVE THE USE OF WATER IN ANY FORM, AND IF THE AGENCY HAS ACQUIRED OR PROPOSES TO ACQUIRE RIGHTS RELATING TO THE CONTROL, APPROPRIATION, USE OR DISTRIBUTION OF WATER.	●	●
JUSTIFICATION OF THE PROPOSED WITHDRAWAL, INCLUDING STATEMENTS SHOWING THE NEED FOR ALL THE AREA REQUESTED, AND THE LIMITATION OF ANY CONCURRENT USES.	●	
CITATION OF THE STATUTORY OR OTHER AUTHORITY FOR THE TYPE OF WITHDRAWAL REQUESTED.	●	

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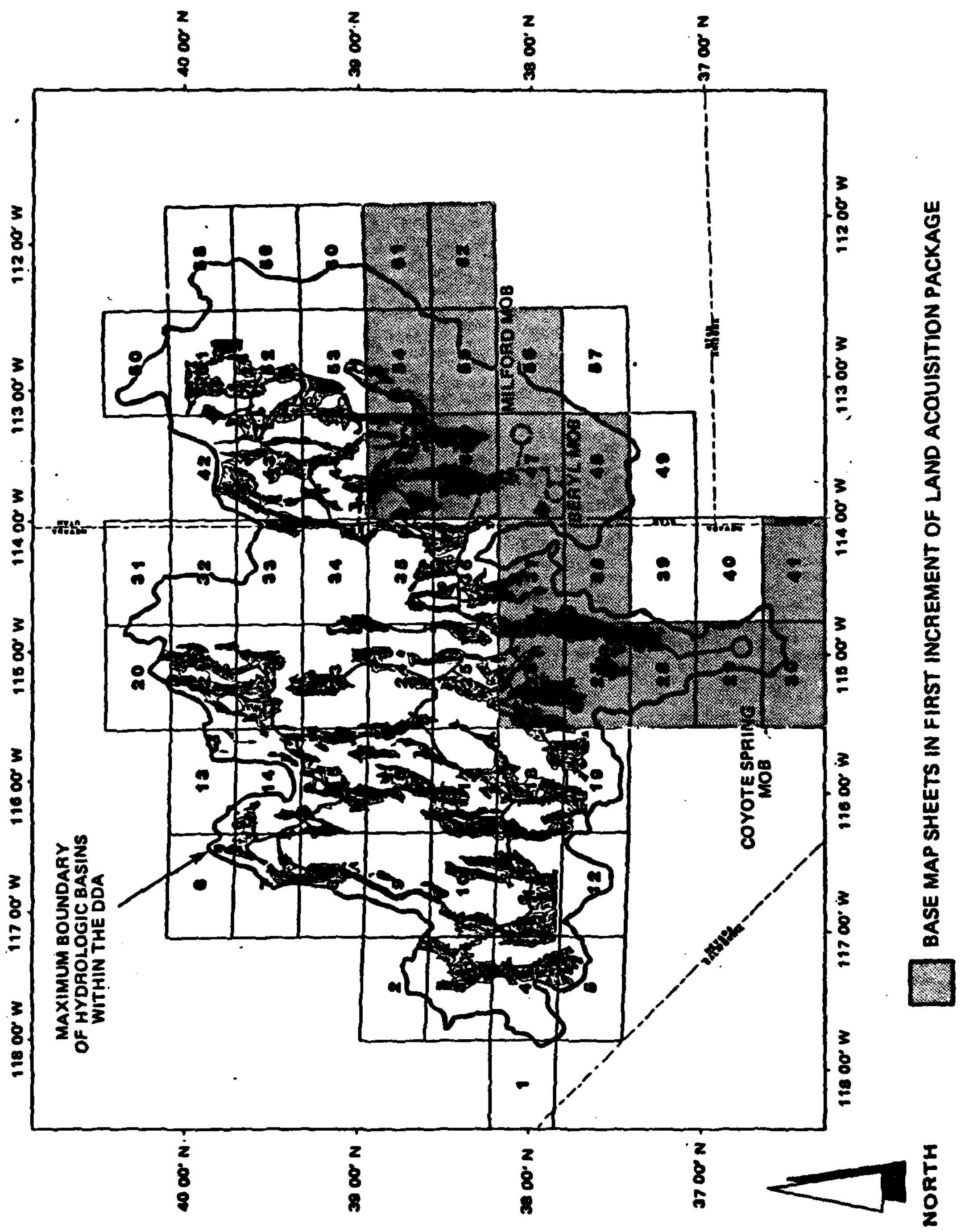
GENERAL SUMMARY OF FLPMA/ENGLE ACT LAND WITHDRAWAL APPLICATION REQUIREMENTS

30 NOV 81 TABLE 4-4



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'E' SIZED (1:62,500) BASE MAP INDEX
DESIGNATED DEPLOYMENT AREA (DDA)
NEVADA/UTAH

30 NOV 81

FIGURE 4-5

and legal descriptions of the MOB/DAA alternatives. COE provided siting data for support facilities and alignments. These data were integrated with Ertec OBTS/DTA, DTN, and IOC valley layout options which were transferred to the "E" size, 1:62,500 scale, topographic base maps.

The first increment consisted of the 17 completed base map sheets. Numerous map sheets were presented more than once in order to depict the various preferred and alternate facility combinations. A list of attachments of the initial increment is in Table 4-5. Generally there were four options for each MOB complex. The options were as follows:

- o Preferred MOB/DAA, Preferred OBTS/DTA;
- o Alternate MOB/DAA, Preferred OBTS/DTA;
- o Preferred MOB/DAA, Alternate OBTS/DTA; and
- o Alternate MOB/DAA, Alternate OBTS/DTA.

By depicting all options, the application could be assembled in a timely manner once the decision makers had selected the final preferred combination. The layouts and connecting DTN for each of the Nevada and Utah IOC valleys were also depicted. A regional map was produced to present the remaining facilities and alignments in the system. These detailed depictions and parcel descriptions of the remaining system were to be provided in later increments.

Land parcel descriptions for the MOB/DAA, OBTS/DTA, and IOC valley facilities were produced and accompanied the drawings. The descriptions of the IOC valley facilities were referenced

Attachment*		Sheet No.*
5-00	Regional Map UT/NV (1:500,000)	
5-01	Explanation Sheet	A
5-02	Option A-Coyote Spring/Description	
5-03	Option A-Coyote Spring/Map (1:62500)	29
5-04	Option B-Coyote Spring/Description	
5-05	Option B-Coyote Spring/Map (1:62500)	29
5-06	Option C-Coyote Spring/Description	
5-07	Option C-Coyote Spring/Map (1:62500)	29
5-08	Option D-Coyote Spring/Description	
5-09	Option D-Coyote Spring/Map (1:62500)	29
5-10	Option E-Milford/Description	
5-11	Option E-Milford/Map (1:62500)	47
5-12	Option E-Milford/Map (1:62500)	56
5-13	Option F-Milford/Description	
5-14	Option F-Milford/Map (1:62500)	47
5-15	Option F-Milford/Map (1:62500)	56
5-16	Option G-Milford/Description	
5-17	Option G-Milford/Map (1:62500)	47
5-18	Option G-Milford/Map (1:62500)	56
5-19	Option H-Milford/Description	
5-20	Option H-Milford/Map (1:62500)	47
5-21	Option H-Milford/Map (1:62500)	56
5-22	Option I-Beryl/Description	
5-23	Option I-Beryl/Map (1:62500)	47
5-24	Option I-Beryl/Map (1:62500)	48
5-25	Option J-Beryl/Description	
5-26	Option J-Beryl/Map (1:62500)	47
5-27	Option J-Beryl/Map (1:62500)	48
5-28	Option K-Beryl/Description	
5-29	Option K-Beryl/Map (1:62500)	47
5-30	Option K-Beryl/Map (1:62500)	48
5-31	Option L-Beryl/Description	
5-32	Option L-Beryl/Map (1:62500)	47
5-33	Option L-Beryl/Map (1:62500)	48
5-34	Dry Lake Valley Description	
5-35	Dry Lake Valley Map (1:62500)	26
5-36	Dry Lake Valley Map (1:62500)	27
5-37	Dry Lake Valley Map (1:62500)	37
5-38	Dry Lake Valley Map (1:62500)	38
5-39	Pine/Wah Wah Valleys/Description	
5-40	Pine/Wah Wah Valleys/Map (1:62500)	45
5-41	Pine/Wah Wah Valleys/Map (1:62500)	46
5-42	Pine/Wah Wah Valleys/Map (1:62500)	54
5-43	DTN fm Coyote OB to Dry Lake Valley/Map (1:62500)	28
5-44	RR fm Mainline to Coyote OB/Map (1:62500)	30
5-45	Powerline fm Power Plant to MOB/Map (1:62500)	41
5-46	Powerline fm Sigurd Substation to MOB/Map (1:62500)	55
5-47	Powerline fm Sigurd Substation to MOB/Map (1:62500)	61
5-48	Powerline fm Sigurd Substation to MOB/Map (1:62500)	62

*THE ITEMS LISTED ARE ATTACHMENTS TO SECTION 5 OF THE LAND ACQUISITION APPLICATION TO BE PREPARED BY THE AFRCE-MX

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LIST OF ATTACHMENTS FOR LAND ACQUISITION APPLICATION PACKAGE NEVADA/UTAH

30 NOV 81 TABLE 4-5

to the U.S. Public Land Survey and are presented in Appendix G of the Shelter Siting Summary (Volume I, Part II). The IOC valley facilities were described by tying the surveyed location of the monument to the nearest U.S. Public Land Survey section corner. The MOB and OBTS parcels consisted of township, range, and quarter section descriptions. The OBTS/DTA parcel descriptions are presented in Appendix C of the OBTS/DTA siting report (Volume II, Part II). These maps and land parcel descriptions were delivered to the AFRCE-MX on 17 September 1981. Revisions to the original maps and a second delivery to the AFRCE-MX were made on 20 October 1981. The revised map sheets in the first increment are presented in Volume III.

The initial Land Acquisition Package had just been completed and reviewed by AFRCE-MX when President Reagan made the decision to terminate the MPS-MX system.

4.3 SITING CONTRACTORS

The siting contractors for the MX system were Ertec, EDAW, and the COE. Table 4-6 summarizes the responsibilities and relationships of these contractors. In order to coordinate the siting activities, technical interchange meetings were held with the Air Force and siting contractors. Additionally, other agencies/contractors participated in working groups and tiering support to achieve overall system coordination (Table 4-7).

4.4 SYSTEM SITING RESULTS

This report presents the activities performed to date in developing a total MX system layout. The results of the siting

Ertec Western, Inc. – Geotechnical and Siting Contractor

— Develop conceptual layouts of the:
- MPS/HSS clusters and associated facilities
- DTN/ASC
- OBTS/DTA
- MOB (prior to EDAW's involvement), AOB

— Compile all siting layouts and land parcel descriptions for the land acquistion application

EDAW, Inc. – MX Base Comprehensive Planner

— Develop conceptual layouts of the:
- MOB
- DAA

— Submit conceptual layouts and land parcel descriptions to Ertec

COE – Design and Construction Contract Manager

— Develop conceptual layouts of the·
- Right-of-way alignments for railroads, utilities, and access roads
- Free use areas (e.g.,borrow pits, quarries)
- Temporary use areas (e.g.,life support camps, batch plants)

— Submit conceptual layouts and land parcel descriptions to Ertec

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MX SITING CONTRACTORS

30 NOV 81 TABLE 4-8

	WORKING GROUPS			
AGENCY/ CONTRACTOR	DTN/ASC	OBTS	OB*	TIERING
BMO	●	●	●	●
AFRCE-MX	●	●	●	●
SAC	●		●	
COE	●	●	●	●
BOEING		●		
EDAW				●
ERTEC	●	●	●	●
HDR	●	●	●	●
MMC	●	●	●	
RMP	●		●	
TRW	●	●	●	●

* PRIOR TO THE EXISTENCE OF THE BASE COMPREHENSIVE PLANNER

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AGENCIES/CONTRACTORS INVOLVED IN MX SITING WORKING GROUPS

30 NOV 81

TABLE 4-7

evaluations performed in Volume I Part I and Volume II, Parts I and II for shelter, DTN/ASC and OBTS/DTA, respectively, for Nevada-Utah are summarized on a regional system map (Drawing 4-1). In New Mexico, evaluations were limited to OBTS siting activities.

The shelter layouts depicted are based on 23/1 clustering, 5200-foot (1585-km) spacing, a 2/3-filled hexagonal pattern, and a direct connect CRN in a MPS/HSS basing mode. There are 227 clusters representing the potential alternatives in selecting an optimum 200 cluster system. The 12 percent cluster excess also provides a buffer against anticipated attrition as a result of more detailed studies.

The DTN alignments connect all 227 clusters and this roadway system is capable of being reduced as the final system develops. Once the MOB is selected, a DTN routing will be selected for final design studies. The ASC sites are also sited for the 227 cluster system. These four sites should not change after final layouts are selected unless the total number of clusters is reduced.

The alternatives for preferred and alternate MOB/DAA and OBTS/DTA options used in the land acquisition application package were presented in that package. Once the decision makers have determined the preferred sites, they will be integrated into the total system and the alternatives sites can be eliminated.

This report does not evaluate a total system in New Mexico. Only IOC and OBTS/DTA alternative sites and the connecting DTN to the MOB were evaluated.

5.0 REFERENCES CITED

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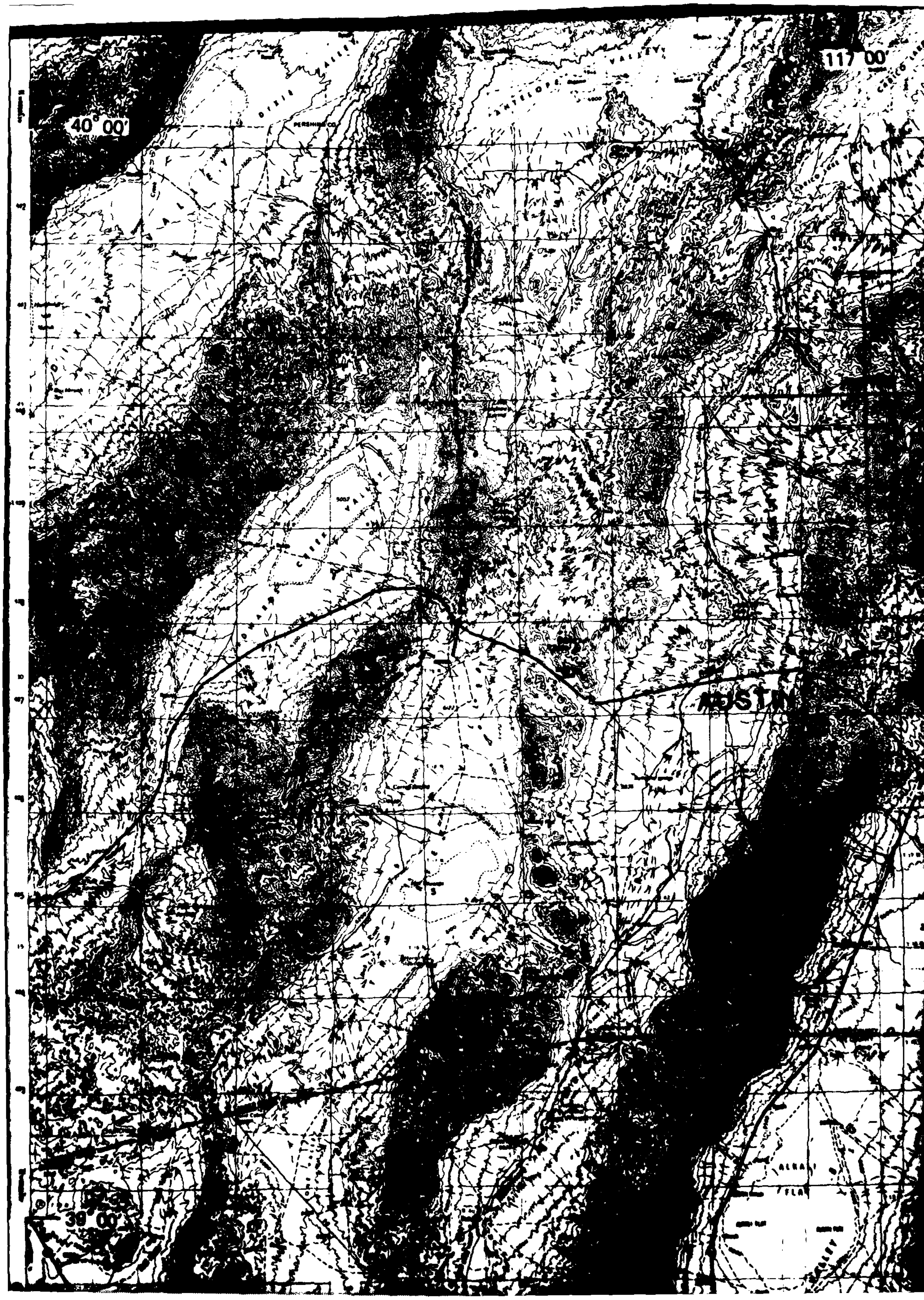
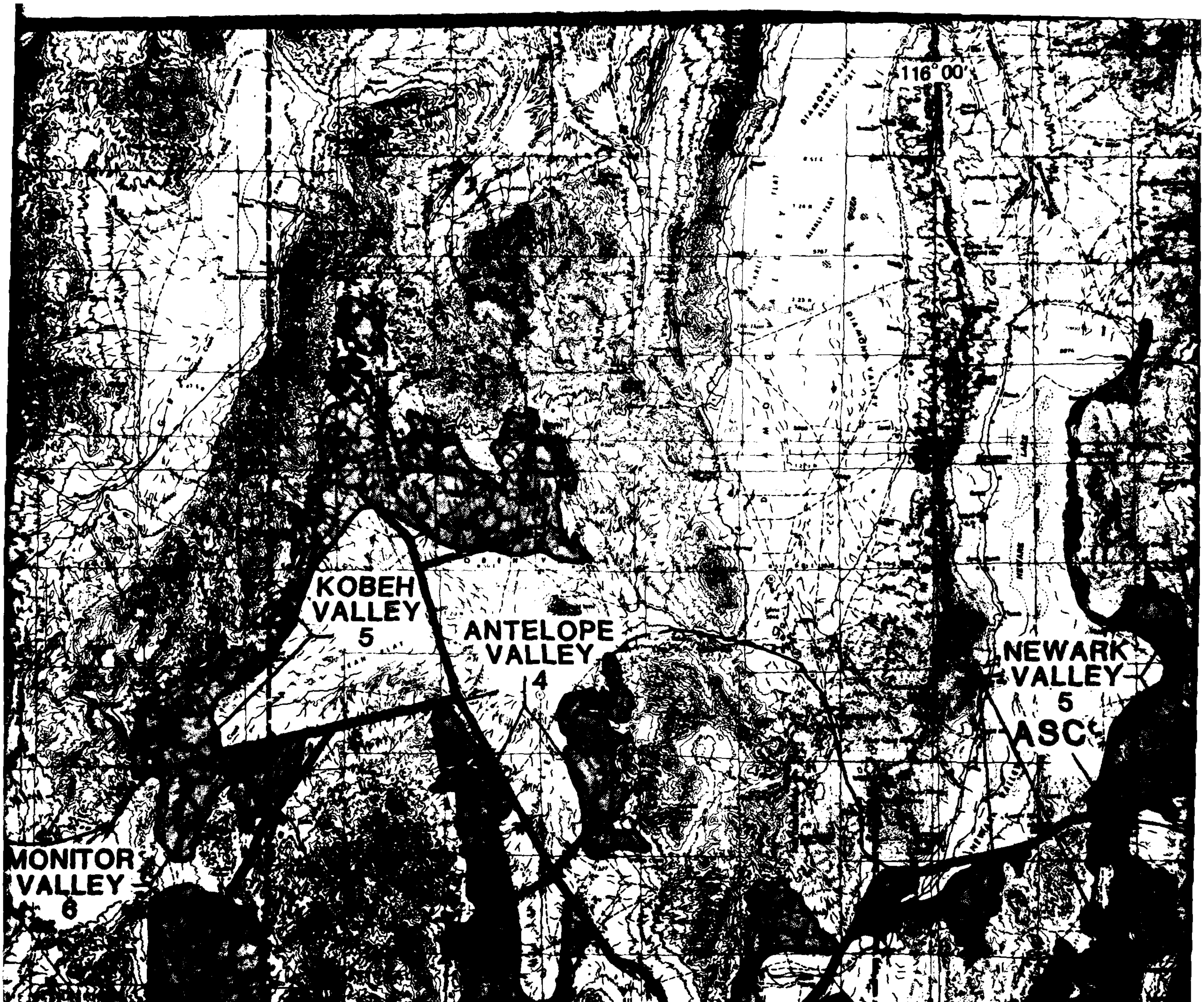
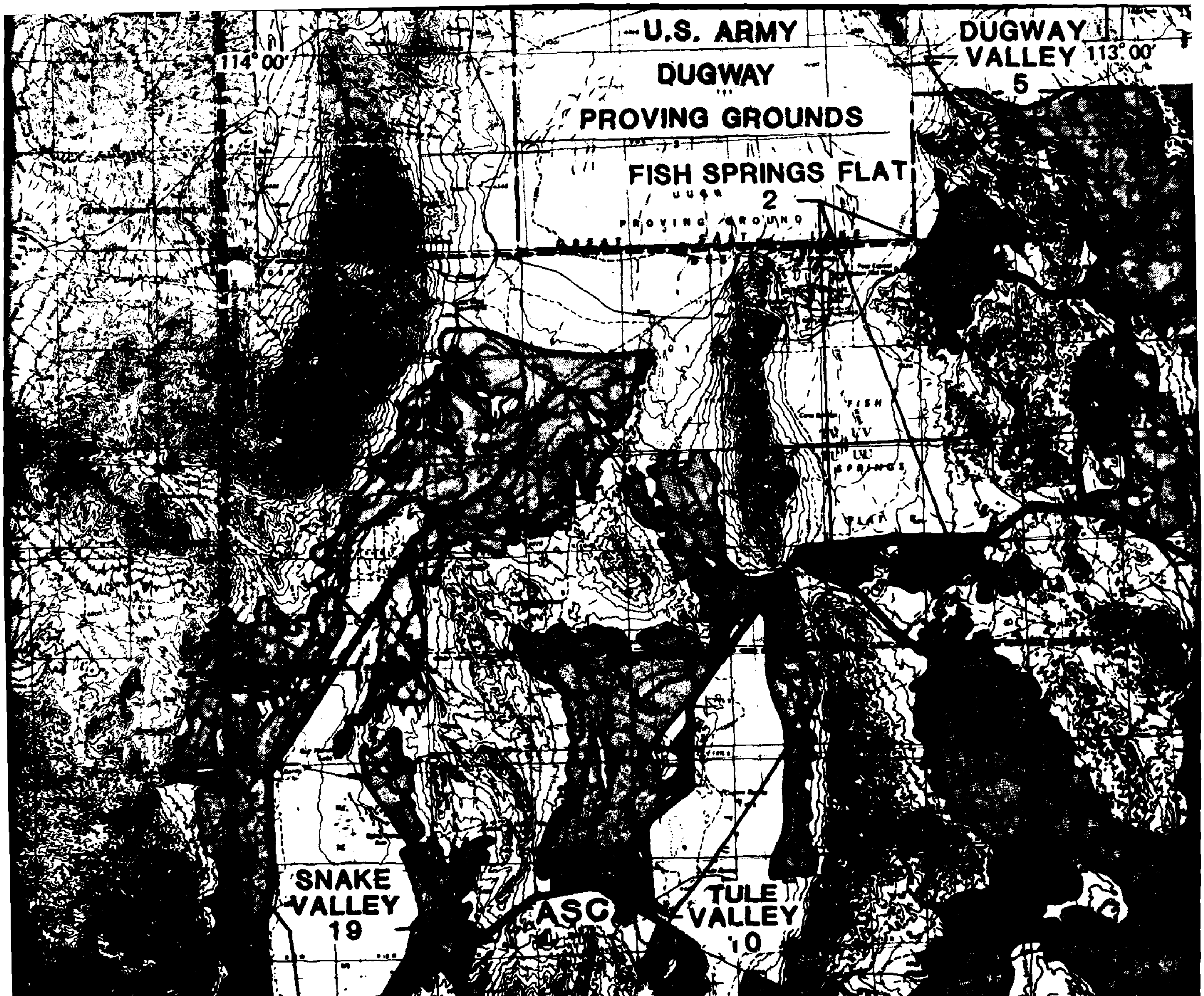
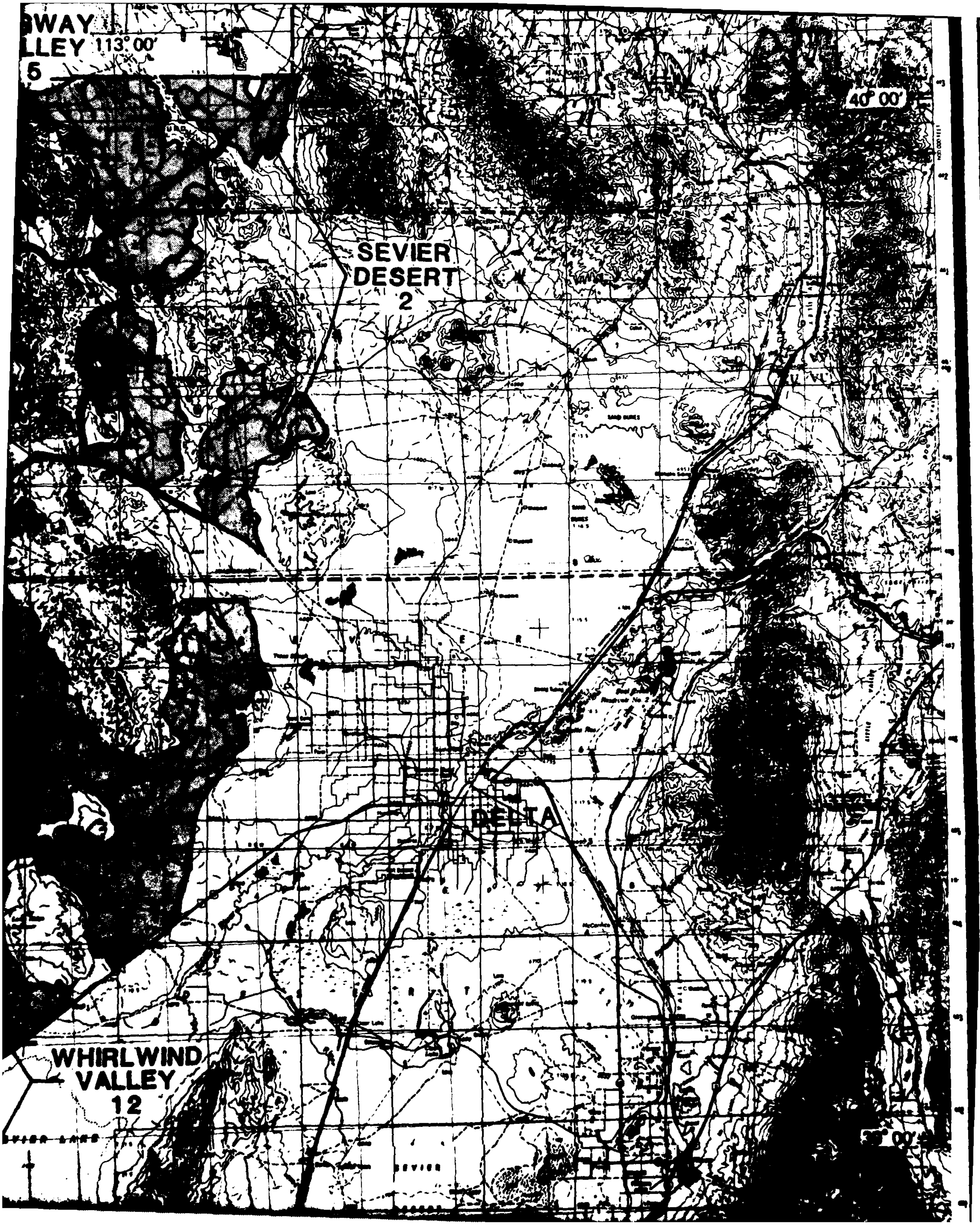

40° 00'
117° 00'
39° 00'


116° 00'
KOBEH VALLEY 5
ANTELOPE VALLEY 4
NEWARK VALLEY 5
ASC
MONITOR VALLEY 6
LITTLE SMOKY

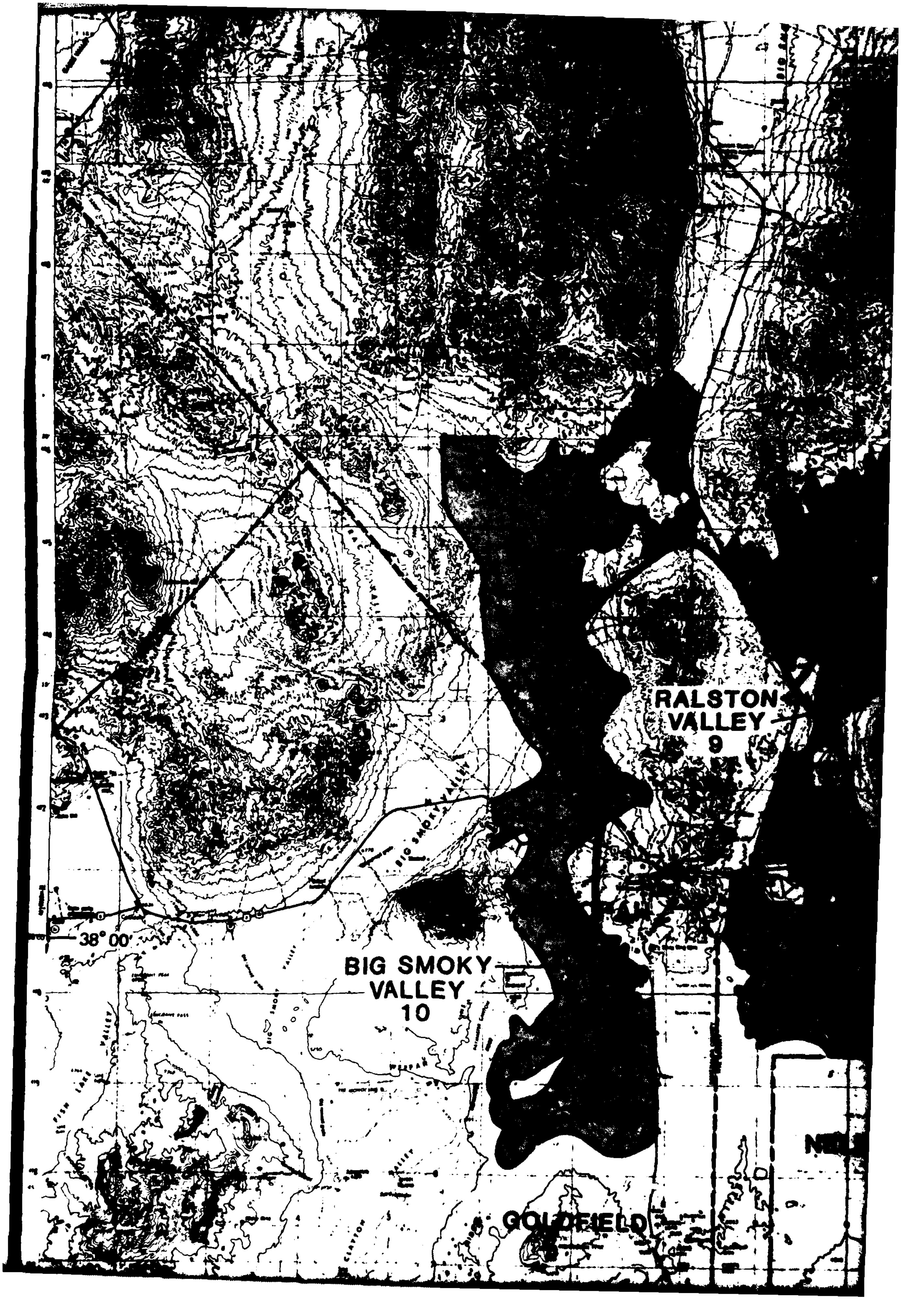

115° 00'
BUTTE VALLEY 9
LONG VALLEY 4
JAKES VALLEY 3
ELY
STEPTOE VALLEY 2
9



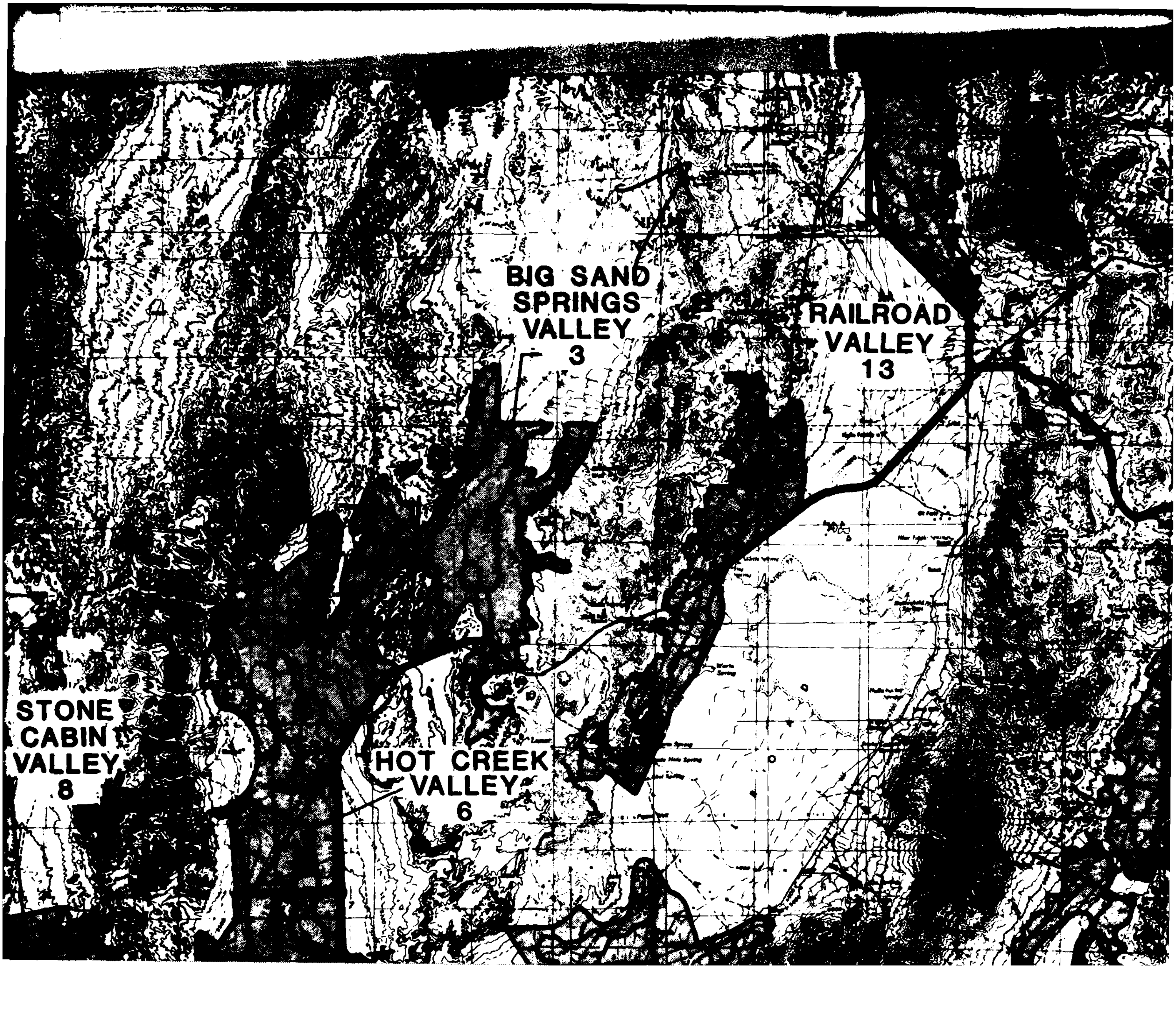
U.S. ARMY
DUGWAY
PROVING GROUNDS
DUGWAY
VALLEY
5
114° 00'
113° 00'
FISH SPRINGS FLAT
2
SNAKE
VALLEY
19
ASC
TULE
VALLEY
10



WAY
LLEY 113° 00'
5
40° 00'
SEVIER
DESERT
2
DELTA
WHIRLWIND
VALLEY
12
39° 00'

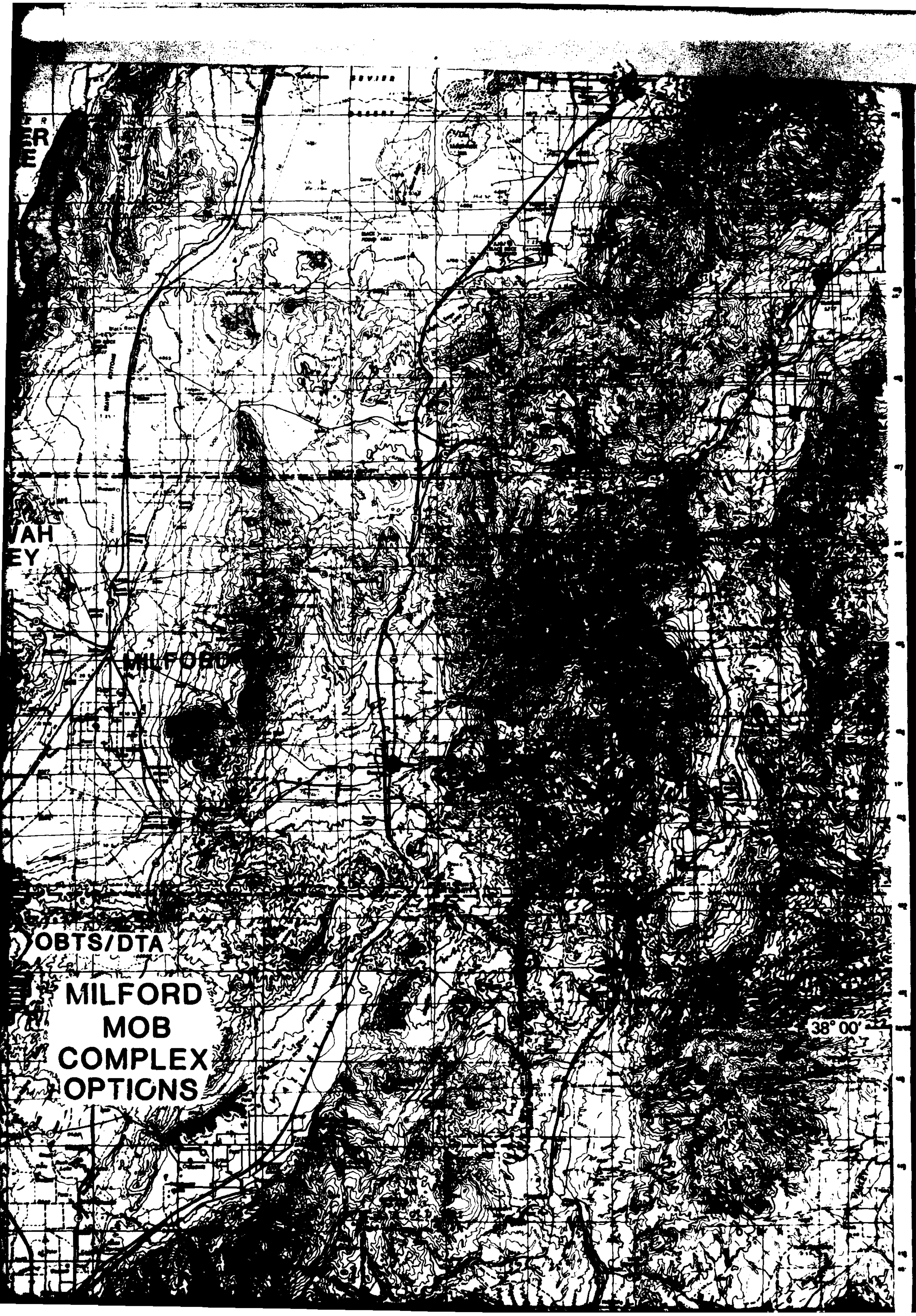


RALSTON
VALLEY
9
38° 00'
BIG SMOKY
VALLEY
10
GOLDFIELD

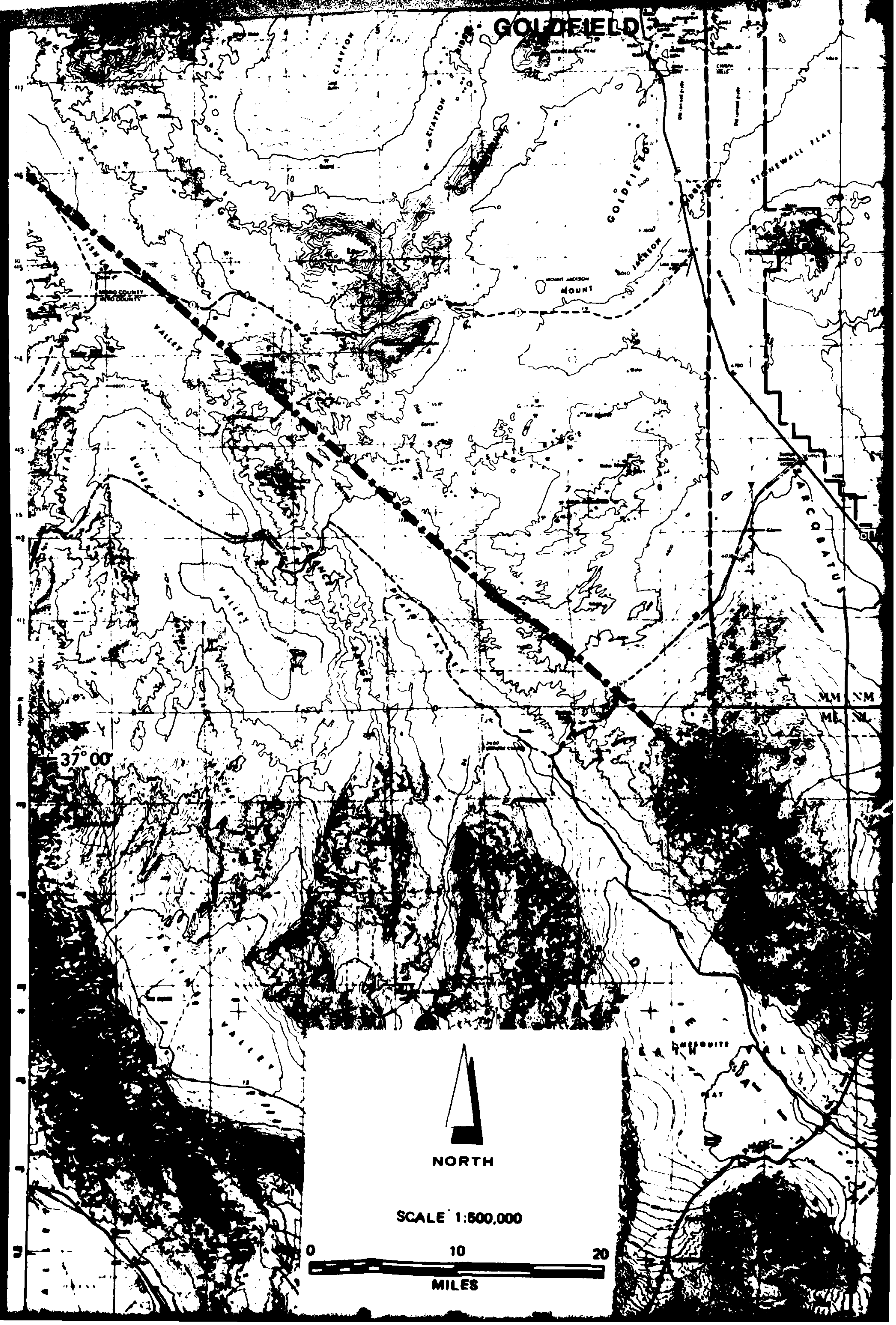

BIG SAND SPRINGS VALLEY 3
RAILROAD VALLEY 13
STONE CABIN VALLEY 8
HOT CREEK VALLEY 6


HAMLIN VALLEY
WHITE RIVER VALLEY 12
SPRING VALLEY 4
WHITE RIVER VALLEY
LAKE VALLEY 7
CAVE VALLEY 3
HAMLIN VALLEY 10
ASC
MULESHOE VALLEY 3
COAL VALLEY 6
DRY LAKE VALLEY 10
PAHROC

SNAKE VALLEY
TULE VALLEY
SEVIER LAKE 1
PINE VALLEY 5
WAH WAH VALLEY 5
MILFORD
MOB/DAA
OBTS/DTA
OBTS/DTA
MOB/DAA
MILFORD MOB COMPLEX OPTIONS
BERYL
MOB/DAA
OBTS/DTA
BERYL MOB



10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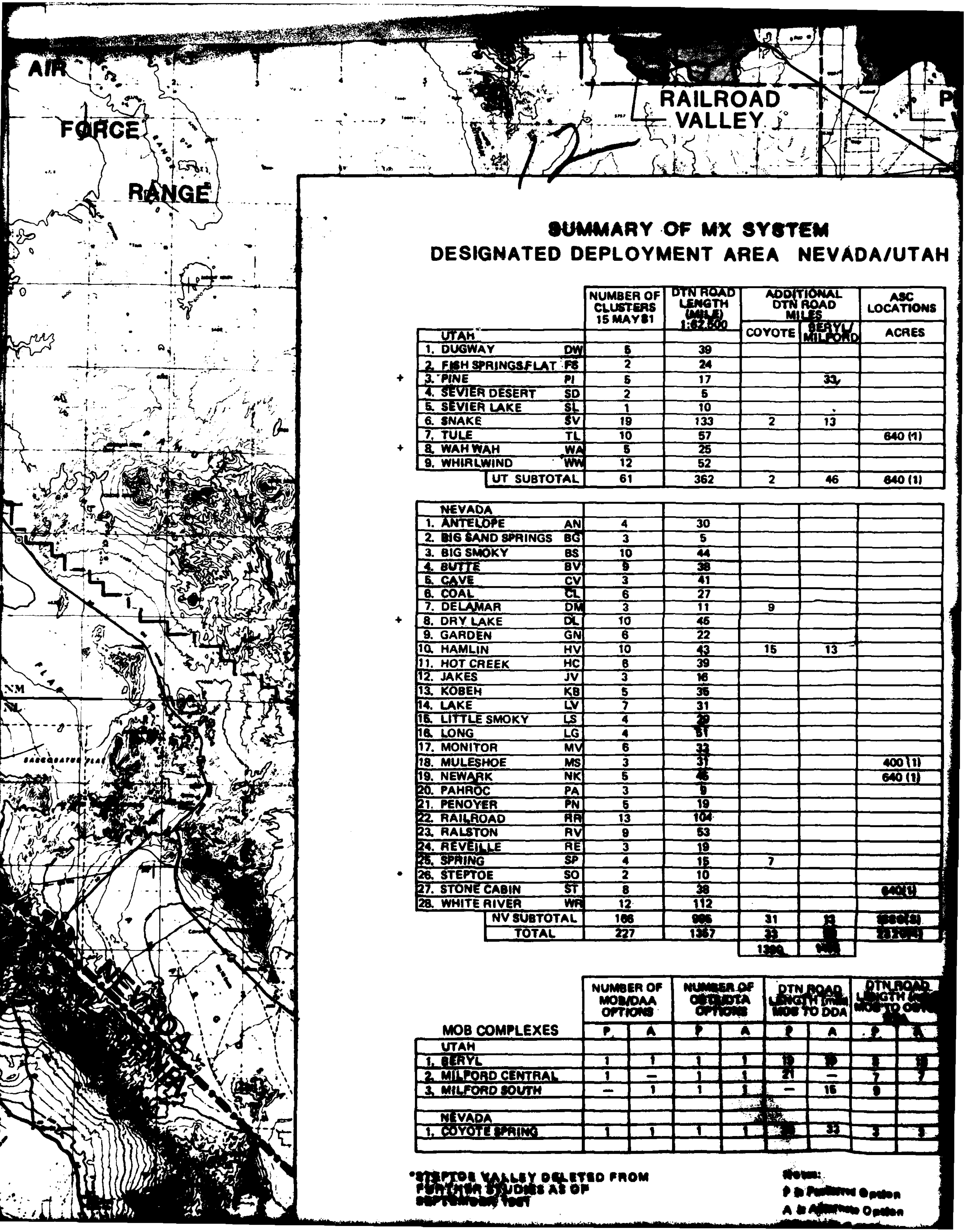
NORTH
SCALE 1:500,000
0
10
20
MILES



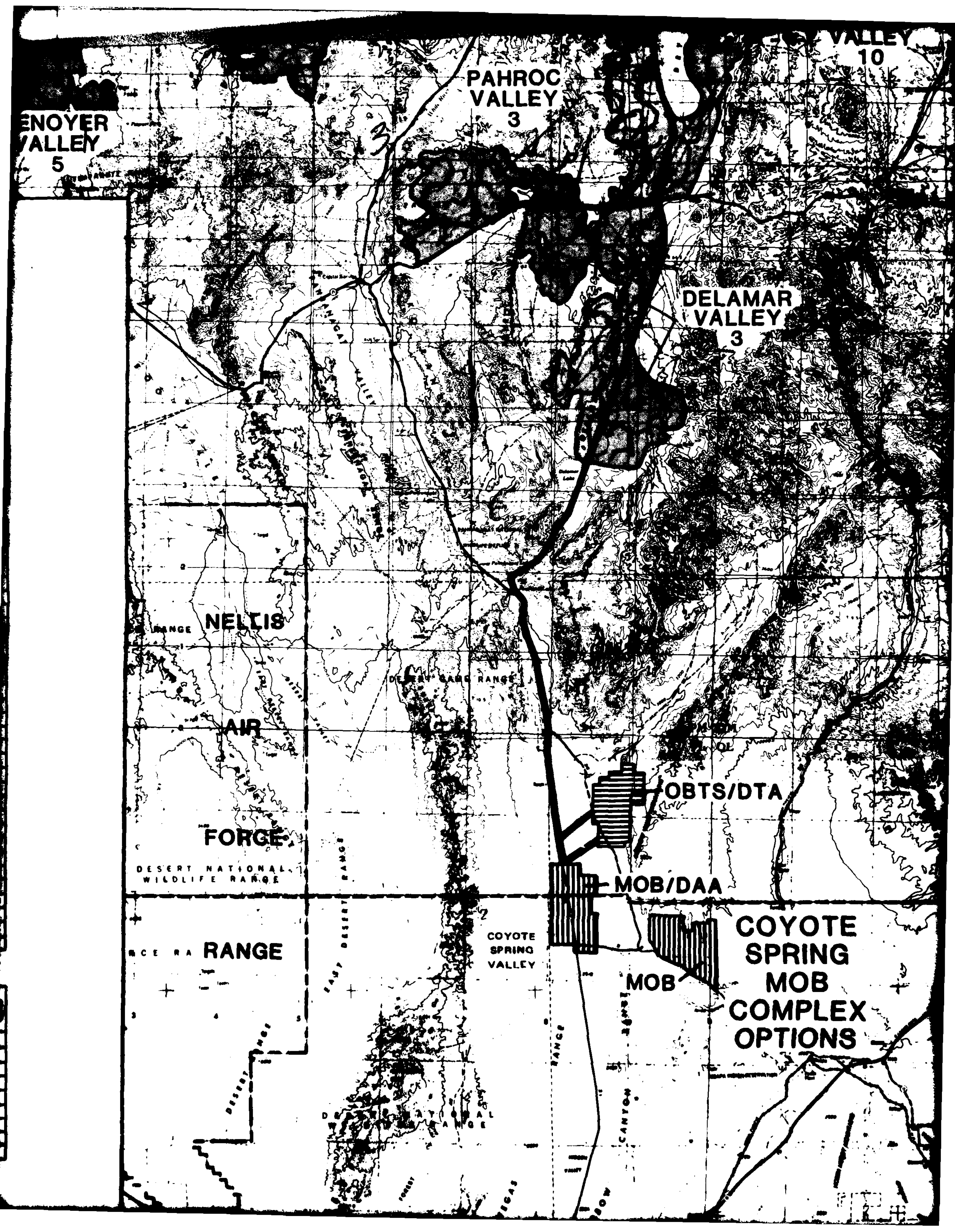
SUMMARY OF MX SYSTEM
DESIGNATED DEPLOYMENT AREA NEVADA/UTAH

			NUMBER OF CLUSTERS 15 MAY 81	DTN ROAD LENGTH (MILE) 1:62,500	ADDITIONAL DTN ROAD MILES		ASC LOCATIONS
					COYOTE	BERYL/ MILFORD	ACRES
	UTAH						
	1. DUGWAY	DW	5	39			
	2. FISH SPRINGS FLAT	FS	2	24			
+	3. PINE	PI	5	17		33	
	4. SEVIER DESERT	SD	2	5			
	5. SEVIER LAKE	SL	1	10			
	6. SNAKE	SV	19	133	2	13	
	7. TULE	TL	10	57			640 (1)
+	8. WAH WAH	WA	5	25			
	9. WHIRLWIND	WW	12	52			
	UT SUBTOTAL		61	362	2	46	640 (1)
	NEVADA						
	1. ANTELOPE	AN	4	30			
	2. BIG SAND SPRINGS	BG	3	5			
	3. BIG SMOKY	BS	10	44			
	4. BUTTE	BV	9	38			
	5. CAVE	CV	3	41			
	6. COAL	CL	6	27			
	7. DELAMAR	DM	3	11	9		
+	8. DRY LAKE	DL	10	46			
	9. GARDEN	GN	6	22			
	10. HAMLIN	HV	10	43	15	13	
	11. HOT CREEK	HC	8	39			
	12. JAKES	JV	3	16			
	13. KOBEH	KB	5	35			
	14. LAKE	LV	7	31			
	15. LITTLE SMOKY	LS	4	20			
	16. LONG	LG	4	51			
	17. MONITOR	MV	6	33			
	18. MULESHOE	MS	3	31			400 (1)
	19. NEWARK	NK	5	46			640 (1)
	20. PAHROC	PA	3	9			
	21. PENOYER	PN	5	19			
	22. RAILROAD	RR	13	104			
	23. RALSTON	RV	9	53			
	24. REVEILLE	RE	3	19			
	25. SPRING	SP	4	15	7		
•	26. STEPTOE	SO	2	10			
	27. STONE CABIN	ST	8	38			640(1)
	28. WHITE RIVER	WR	12	112			
	NV SUBTOTAL		166	995	31	13	[illegible]
	TOTAL		227	1357	33	[illegible]	[illegible]
					1390	[illegible]	

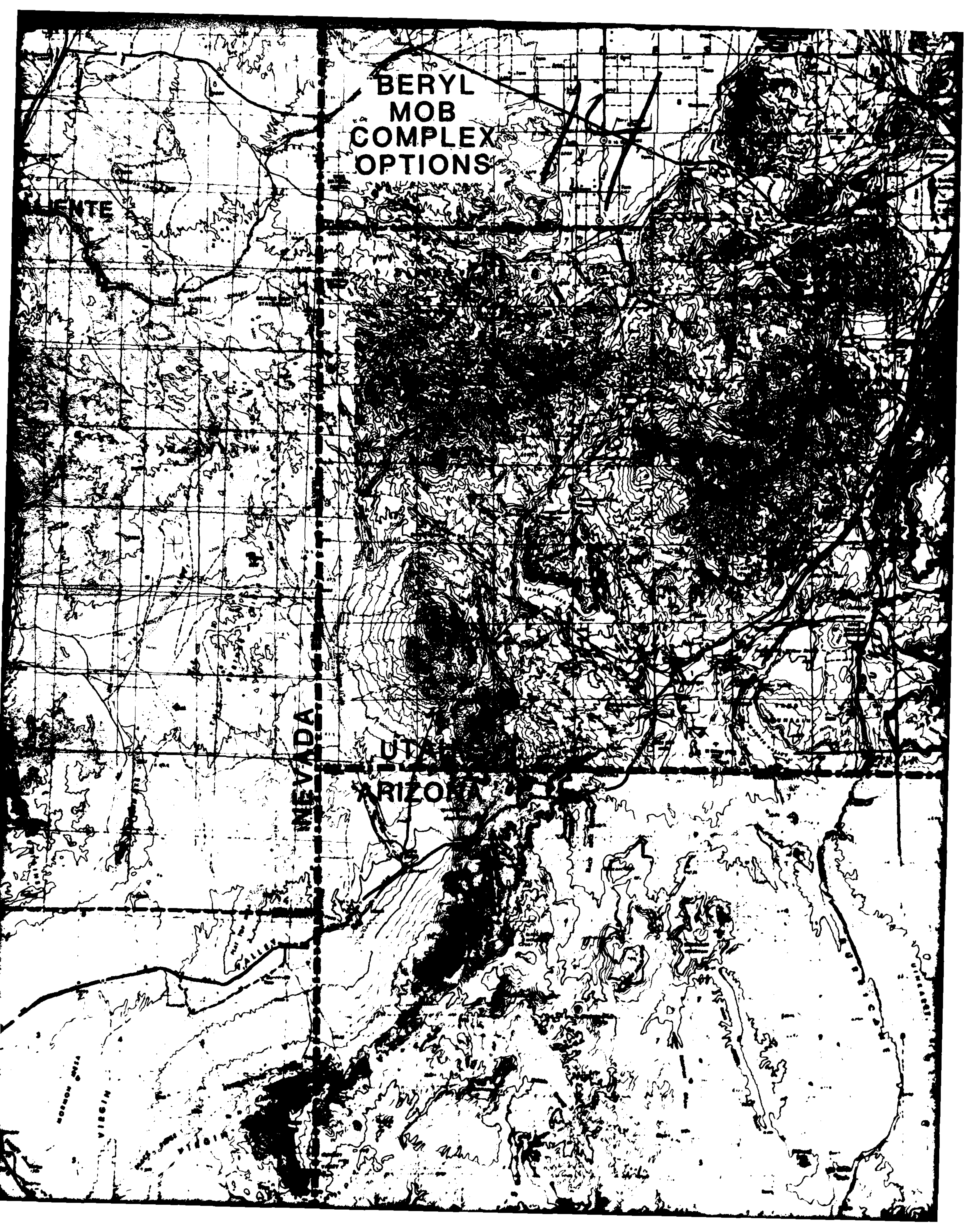
MOB COMPLEXES	NUMBER OF MOB/DAA OPTIONS		NUMBER OF OSTB/DTA OPTIONS		DTN ROAD LENGTH (MI) MOB TO DDA		DTN ROAD LENGTH (MI) MOB TO [illegible]	
	P	A	P	A	P	A	P	A
UTAH								
1. BERYL	1	1	1	1	19	[illegible]	8	[illegible]
2. MILFORD CENTRAL	1	—	1	1	21	—	7	7
3. MILFORD SOUTH	—	1	1	1	—	15	9	
NEVADA								
1. COYOTE SPRING	1	1	1	1	[illegible]	33	3	3

*STEPTOE VALLEY DELETED FROM FURTHER STUDIES AS OF SEPTEMBER 1981

Notes:
P is Preferred Option
A is Alternate Option



VALLEY
10
PAHROC
VALLEY
3
ENOYER
VALLEY
5
DELAMAR
VALLEY
3
NELLIS
AIR
FORCE
RANGE
DESERT NATIONAL
WILDLIFE RANGE
OBTS/DTA
MOB/DAA
COYOTE
SPRING
VALLEY
MOB
COYOTE
SPRING
MOB
COMPLEX
OPTIONS


BERYL
MOB
COMPLEX
OPTIONS
NEVADA
UTAH
ARIZONA

EXPLANATION

PORTION OF SUITABLE AREA CLUSTERED

CLUSTER ROAD NETWORK (CRN)

MAIN OPERATING BASE (MOB)/DESIGNATED ASSEMBLY AREA (DAA) OPTIONS

OPERATIONAL BASE TEST SITE (OBTS)/DESIGNATED TRAINING AREA (DTA) OPTIONS

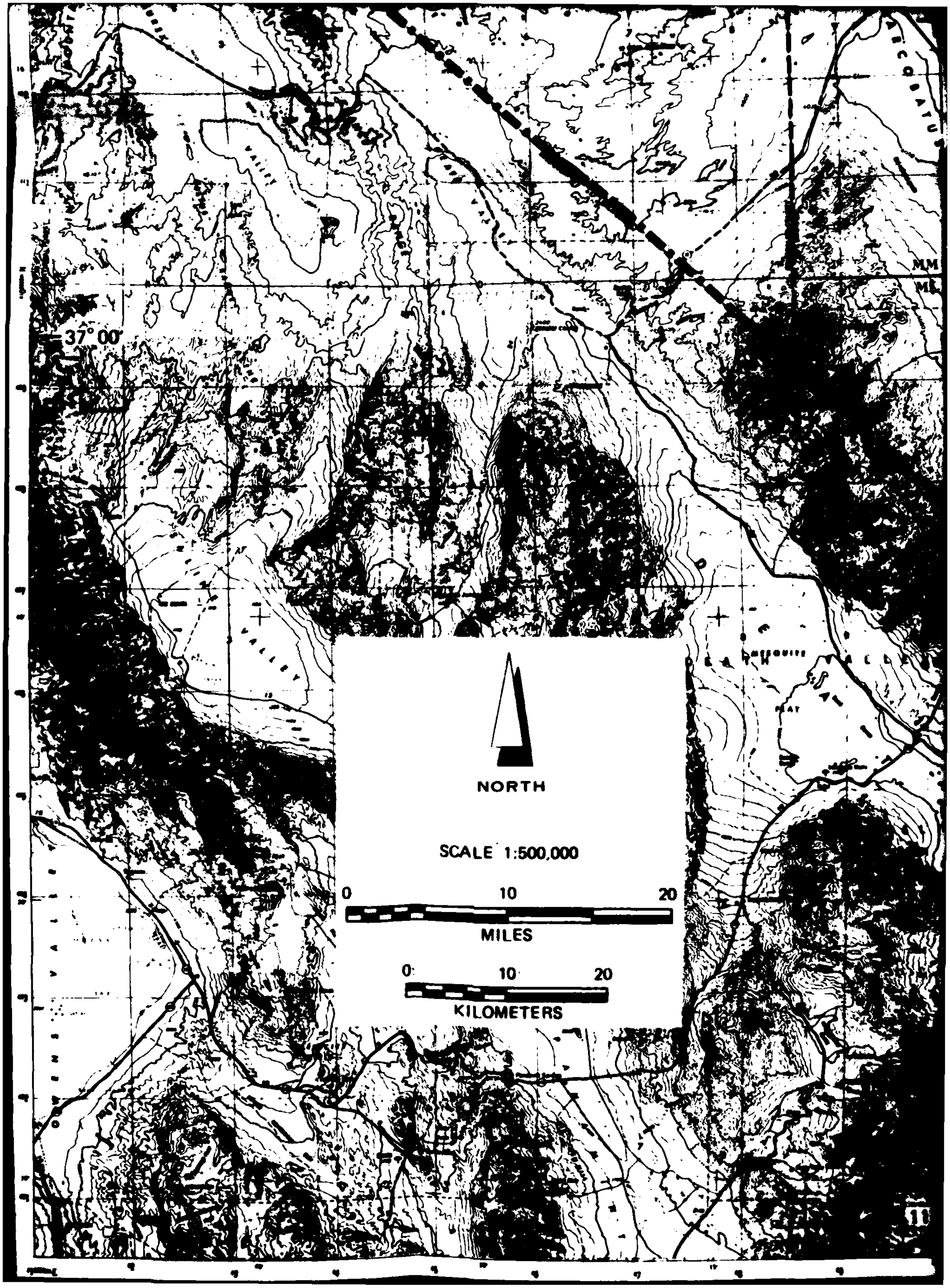
AREA SUPPORT CENTER (ASC)

ROUTE OF DESIGNATED TRANSPORTATION NETWORK (DTN) FOR MOB SITE IN COYOTE SPRING VALLEY, NEVADA

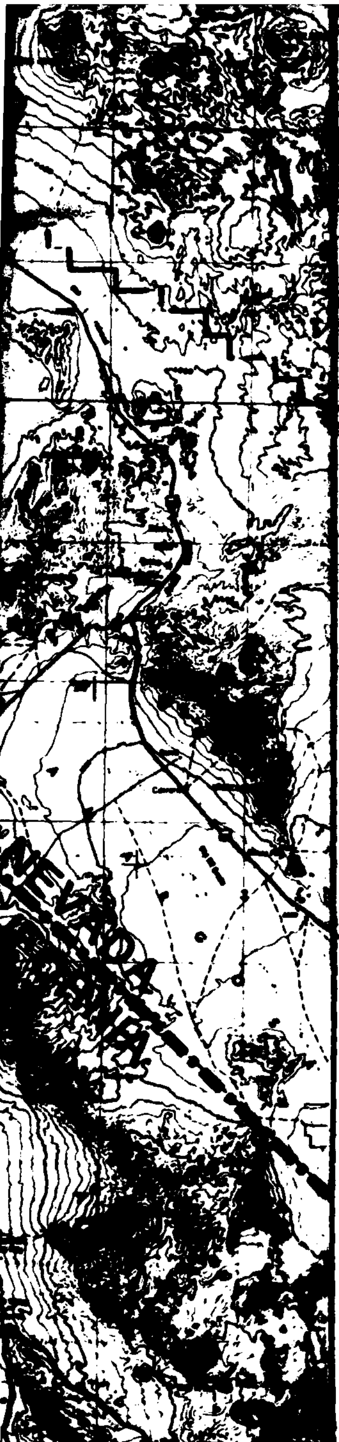
ROUTE OF ADDITIONAL DTN FOR MOB SITE AT BERYL OR MILFORD, UTAH. REDUCTIONS IN DTN FOR AN MOB SITE IN COYOTE SPRING VALLEY ARE NOT SHOWN.

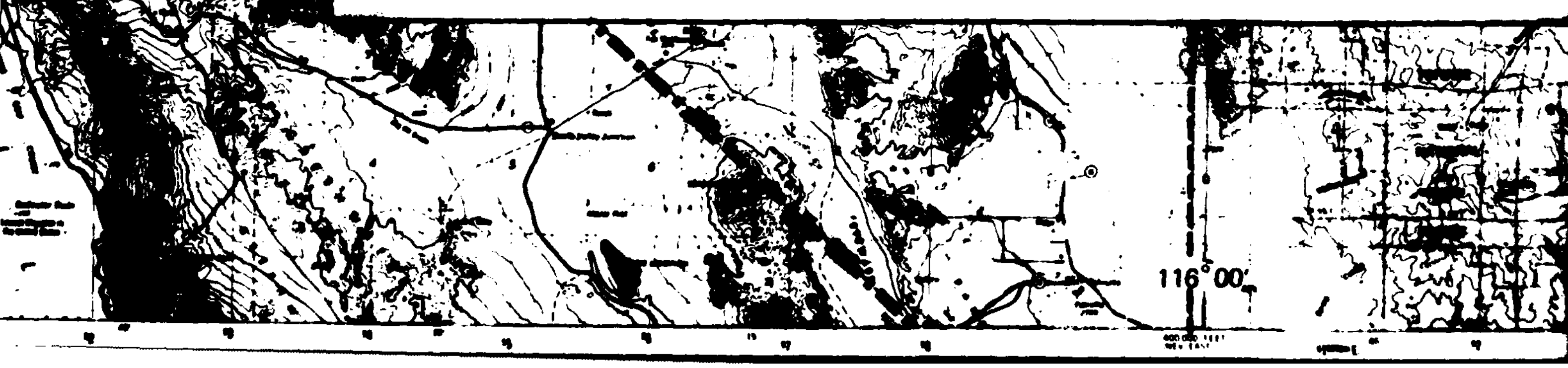
NOTES:

1. CLUSTERED AREAS ARE BASED ON 5200 + 200– FOOT SPACING, 2/3 FILLED HEXAGONAL PATTERN, WITH 23 PRIMARY MULTIPLE PROTECTIVE STRUCTURES (SHELTERS).
2. THE NUMBER BY EACH VALLEY NAME IS THE NUMBER OF CLUSTERS BASED ON THE MOST RECENT LAYOUT DRAWINGS.
3. MOB/DAA AND OBTS/DTA OPTIONS REPRESENT LAND PARCEL DESCRIPTIONS DEPICTED IN LAND ACQUISITION PACKAGE (17 SEPT 81).



37° 00'
NORTH
SCALE 1:500,000
0
10
20
MILES
0
10
20
KILOMETERS
MESQUITE
FLAT
VALLEY





UT SUBTOTAL		61	362	[illegible]	[illegible]	[illegible]
NEVADA						
1. ANTELOPE	AN	4	30			
2. BIG SAND SPRINGS	BG	3	5			
3. BIG SMOKY	BS	10	44			
4. [illegible]	BV	[illegible]	[illegible]			
5. CAVE	CV	3	41			
6. COAL	CL	6	27			
7. DELAMAR	DM	3	11	9		
+ 8. DRY LAKE	DL	10	45			
9. GARDEN	GN	6	22			
10. HAMLIN	HV	10	43	15	13	
11. HOT CREEK	HC	8	39			
12. JAKES	JV	3	16			
13. KOBEH	KB	5	35			
14. LAKE	LV	7	31			
15. LITTLE SMOKY	LS	4	29			
16. LONG	LG	4	31			
17. MONITOR	MV	6	33			
18. MULESHOE	MS	3	31			400 (1)
19. NEWARK	NK	5	45			640 (1)
20. PAHROC	PA	3	9			
21. PENOYER	PN	5	19			
22. RAILROAD	RR	13	104			
23. RALSTON	RV	9	53			
24. REVEILLE	RE	3	19			
25. SPRING	SP	4	15	7		
* 26. STEPTOE	SO	2	10			
27. STONE CABIN	ST	8	38			640(1)
28. WHITE RIVER	WR	12	112			
NV SUBTOTAL		166	995	31	13	1680(3)
TOTAL		227	1357	33	59	2320(4)
				1390	1416	

MOB COMPLEXES	NUMBER OF MOB/DAA OPTIONS		NUMBER OF OBTS/DTA OPTIONS		DTN ROAD LENGTH (mile) MOB TO DDA		DTN ROAD LENGTH (mile) MOB TO OBTS/DTA	
	P	A	P	A	P	A	P	A
UTAH								
1. BERYL	1	1	1	1	19	19	8	18
2. MILFORD CENTRAL	1	—	1	1	21	—	7	7
3. MILFORD SOUTH	—	1	1	1	—	15	9	
NEVADA								
1. COYOTE SPRING	1	1	1	1	33	33	3	3

*STEPTOE VALLEY DELETED FROM FURTHER STUDIES AS OF SEPTEMBER 1981

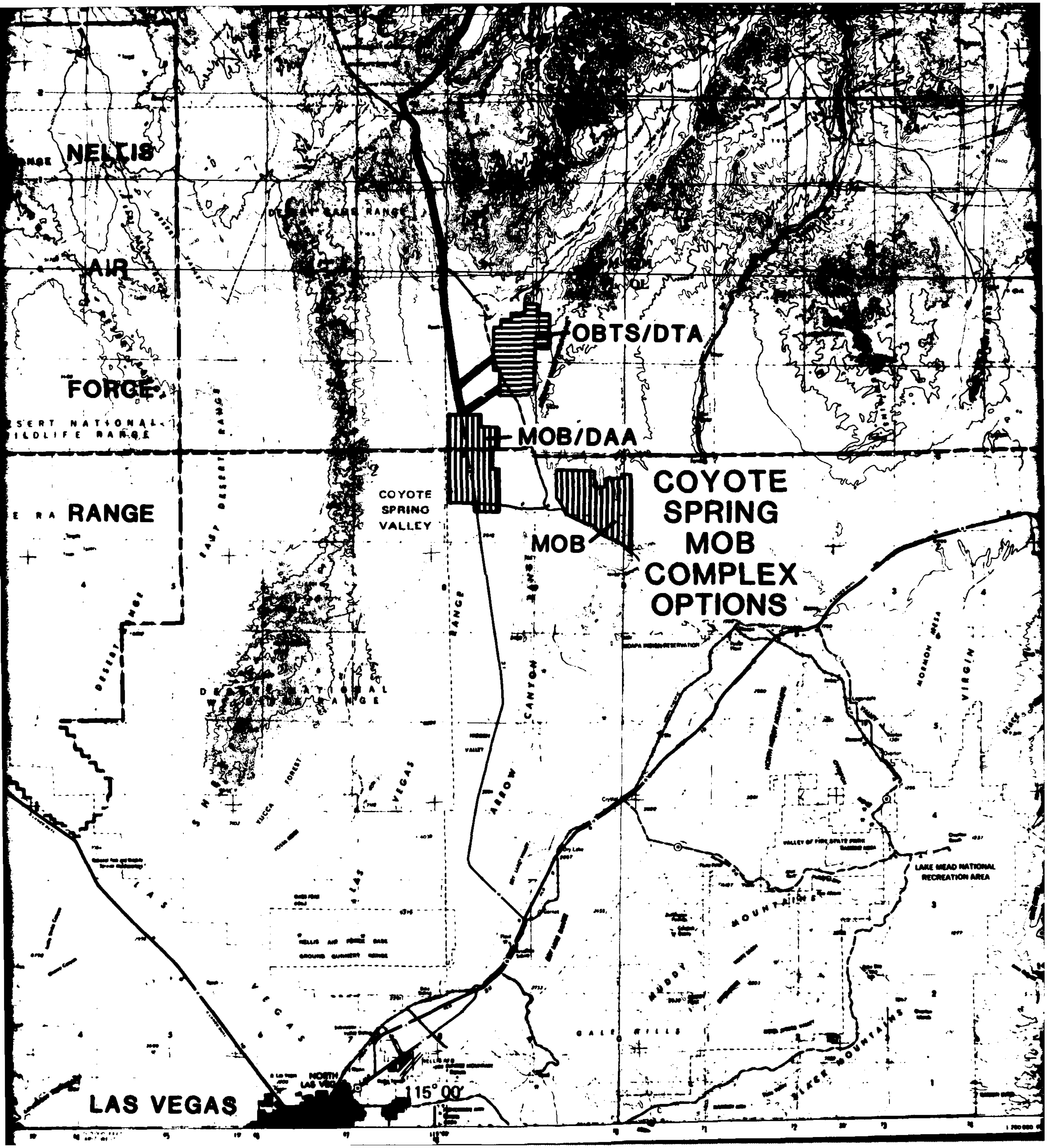
+IOC VALLEYS

Notes:

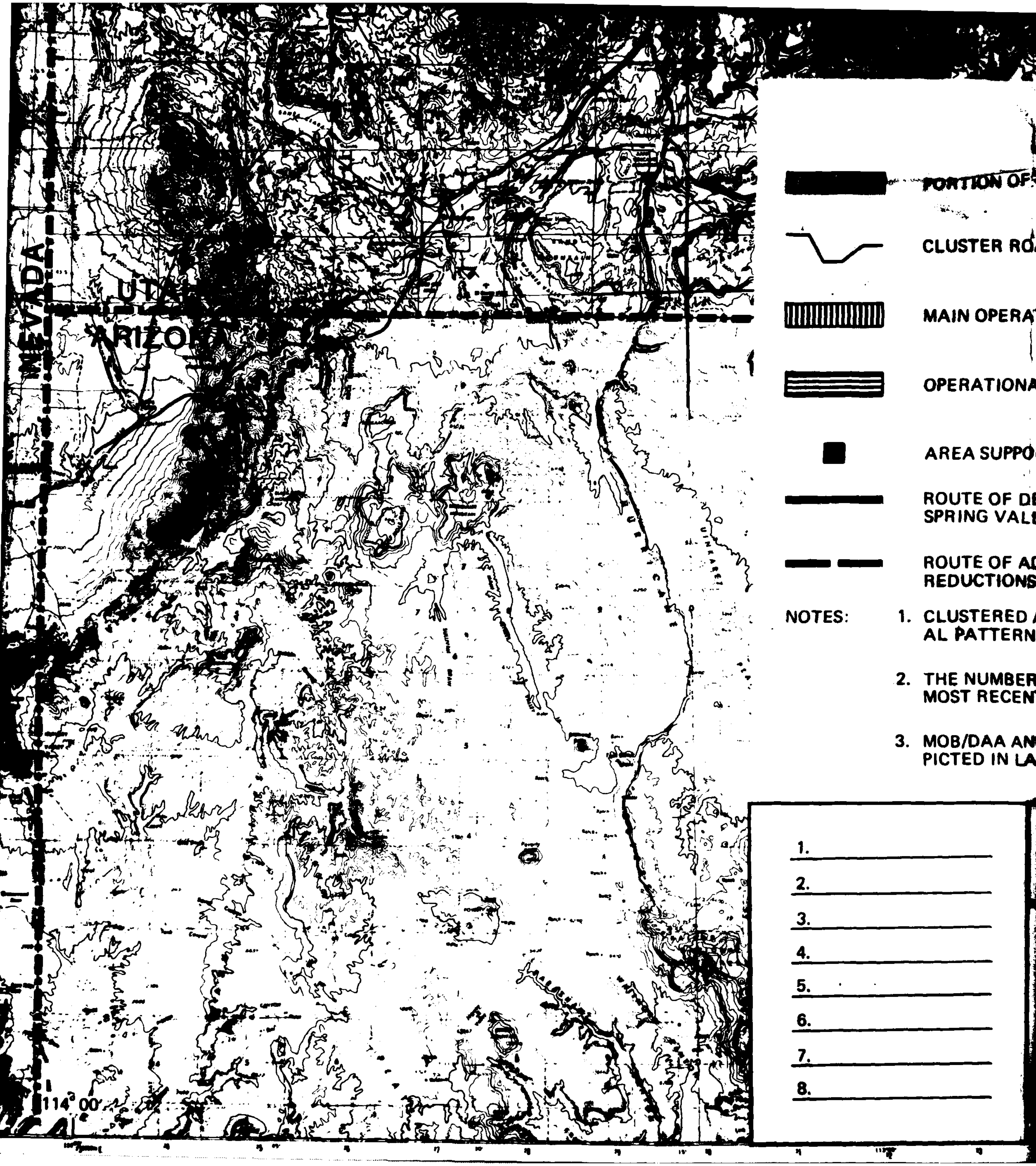
P is Preferred Option

A is Alternate Option

(1) Number of ASC's



NELLIS
AIR
FORCE
RANGE
OBTS/DTA
MOB/DAA
COYOTE SPRING VALLEY
COYOTE SPRING MOB COMPLEX OPTIONS
MOB
LAS VEGAS
NORTH LAS VEGAS
115°00'
LAKE MEAD NATIONAL RECREATION AREA
ARROW CANYON RANGE
MUDDY MOUNTAINS


NEVADA
UTAH
ARIZONA
114° 00'
PORTION OF
CLUSTER RO
MAIN OPERAT
OPERATIONA
AREA SUPPOR
ROUTE OF DE
SPRING VALL
ROUTE OF AD
REDUCTIONS
NOTES:
1. CLUSTERED A
AL PATTERN,
2. THE NUMBER
MOST RECENT
3. MOB/DAA AN
PICTED IN LA
1.
2.
3.
4.
5.
6.
7.
8.

EXPLANATION

PORTION OF SUITABLE AREA CLUSTERED

CLUSTER ROAD NETWORK (CRN)

MAIN OPERATING BASE (MOB)/DESIGNATED ASSEMBLY AREA (DAA) OPTIONS

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3. MOB/DAA AND OBTS/DTA OPTIONS REPRESENT LAND PARCEL DESCRIPTIONS DEPICTED IN LAND ACQUISITION PACKAGE (17 SEPT 81).

1. ________
2. ________
3. ________
4. ________
5. ________
6. ________
7. ________
8. ________

Ertec
The Earth Technology Corporation

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE
BMO/AFRCE-MX

MX SYSTEM
DESIGNATED DEPLOYMENT AREA
NEVADA/UTAH

30 NOV 81

VOLUME [illegible]
DRAWING 4-1

MX SYSTEM SITING
SUMMARY REPORT

SHELTER SITING SUMMARY
VOLUME I, PART II

Prepared for:

U.S. Department of the Air Force
Ballistic Missile Office
Norton Air Force Base, California 92409

Preapred by:

Ertec Western, Inc.
3777 Long Beach Boulevard
Long Beach, California 90807

18 January 1982

Ertec

FOREWORD

This report has been prepared for the U.S. Department of the Air Force, Ballistic Missile Office, in compliance with Contract No. F04704-80-C-0006. It presents the summary of Ertec Western's investigations for siting of facilities and routing of a transportation network for the MX system in Nevada, Utah, and New Mexico. Information, results, and conclusions contained in this report are based on MX siting studies conducted during fiscal years 1980 and 1981. The major part of the study covers 37 deployment valleys and three main operating base sites in Nevada and Utah. Limited studies were also performed in the area surrounding the main operating base site in New Mexico. This report consists of three volumes.

<u>Volume I, Part I</u>

- General Introduction providing brief overviews of the MX system, program schedule, and siting program which includes:
  - Introduction
  - Summary of MX System Components
  - MX Program Schedule Overview
  - Siting Program Overview

<u>Volume I, Part II</u>

- Summary discussions of results, conclusions, and recommendations of the Shelter Siting Summary studies of the 37 deployment valleys which includes:
  - Introduction
  - Siting Requirements
  - Siting Methodology
  - MPS/HSS Siting Program, Nevada/Utah DDA
  - Shelter Siting Program Summary, Conclusions, and Recommendations

<u>Volume II, Part I</u>

- Results and conclusions of the Designated Transportation Network/Area Support Centers (DTN/ASC) siting studies within the MX system study areas which includes:
  - Introduction
  - Objective and Scope
  - Methodology
  - Criteria
  - Field Reconnaissance and Pass Evaluation
  - Evaluation of Optimum DTN Routings and ASC Locations
  - Conclusions

Volume II, Part II

o Results and conclusions of the Operational Base Test Site/ Designated Training Area (OBTS/DTA) siting studies near the main operating base sites in Nevada-Utah and New Mexico which includes:

  - Introduction
  - Siting Requirements
  - Methodology
  - OBTS/DTA Siting Evaluation
  - Conclusions

Volume III

o Land Acquisition Application Package Map Sheets depicting the various preferred and alternate facility combinations for land parcel acquisition which includes:

  - Introduction

This report was being prepared prior to the President's decision on 2 October 1981 not to proceed with the MPS MX basing option. It was intended that more detailed valley siting reports would follow this general evaluation. The original objective of the report was to provide interim data to the users of MX siting data until these more detailed evaluations could be produced. As a result of the President's decision, this report represents the final summary of the MX system siting in the MPS basing mode.

It should be noted that at the beginning of FY 81, siting studies were performed under the firm name of Fugro National, Inc. at its Long Beach offices. On 25 March 1981, the corporate name was changed to The Earth Technology Corporation - Ertec. Since that date, the siting studies have been performed at the same offices under the name of Ertec Western, Inc. with support from Ertec Northwest, Inc., Seattle, Washington; Ertec Airborne Systems, Inc., Cypress, California; and Ertec Rocky Mountain, Inc., Denver, Colorado.

LIST OF ACRONYMS

ADT	Average Daily Traffic
AFRCE-MX	Air Force Regional Civil Engineer-MX
AFSC	Air Force System Command
ALCC	Airborne Launch Control Center
AOB	Auxiliary Operating Base
ASC	Area Support Center
BLM	Bureau of Land Management
BMO	Ballistic Missile Office
C^3	Command, Control, and Communication
CBR	California Bearing Ratio
CDP	Candidate Deployment Parcel
CEQ	Council on Environmental Quality
CMF	Cluster Maintenance Facility
COE	U. S. Department of the Army, Corps of Engineers
CONUS	Conterminous United States
CPT	Cone Penetrometer Test
CRN	Cluster Road Network
CSR	Candidate Siting Region
DAA	Designated Assembly Area
DDA	Designated Deployment Area
DEIS	Draft Environmental Impact Statement
DMA	Defense Mapping Agency
DOPAA	Description of Proposed Actions and Alternatives
DTA	Designated Training Area
DTN	Designated Transportation Network
EIS	Environmental Impact Statement
FLPMA	Federal Land Policy Management Act
FNI	Fugro National, Inc.
FSED	Full Scale Engineering Development
FY	Fiscal Year
GBNP	Great Basin National Park
HDR	Henningson, Durham, & Richardson, Inc.
HSS	Horizontal Shelter Site
IOC	Initial Operational Capability
KGRA	Known Geothermal Resources Area
MF	Medium Frequency
MMC	Martin Marietta Company
MOA	Military Overflight Area
MOB	Main Operating Base
MPS	Multiple Protective Structure
MPT	Mobile Patrol Teams
NCA	National Control Authorities
NEPA	National Environmental Policy Act
NH&S	Nuclear Hardness and Survivability
OB	Operational Base
OBTS	Operational Base Test Site

OSR	Operational Support Road
PLU	Preservation of Location Uncertainty
PMOA	Programmetric Memorandum of Agreement
POL	Petroleum, Oils, and Lubricants
PS	Protective Structure
QA	Quality Assurance
QD	Quantity Distance
R&D	Research and Development
REPR	Real Estate Planning Report
RES	Renewable Energy Sources
RMP	Ralph M. Parsons Company
ROW	Right-of-way
RSS	Remote Surveillance Site
SAC	Strategic Air Command
SALT	Strategic Arms Limitation Talks
SHPO	State Historic Preservation Officer
STV	Special Transport Vehicle
T&E	Threatened and Endangered
TEL	Transporter and Erector Launcher
TI	Technical Interchange
TSB	Test Support Building
USGS	United States Geological Survey
USPLS	United States Public Land Survey
UTM	Universal Transverse Mercator
V&H	Vulnerability and Hardness

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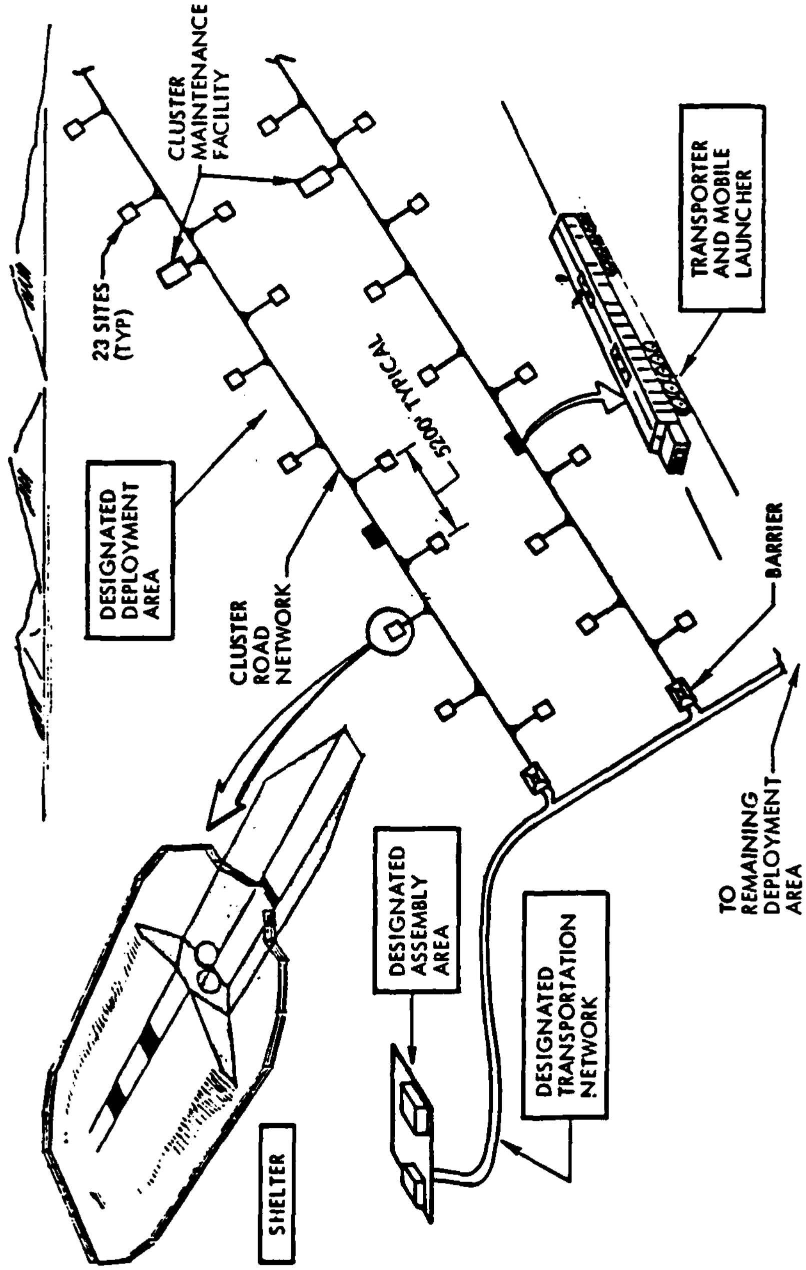
1.0 INTRODUCTION

This report presents a summary of the studies performed by Ertec Western, Inc. (Ertec) on the preliminary siting and conceptual layout of the MX Multiple Protective Structure/Horizontal Shelter Site (MPS/HSS) basing mode in the Nevada-Utah siting area.

The baseline MX system consists of 200 missiles to be deployed in 4600 protective structures (i.e., shelters) within a Designated Deployment Area (DDA). Each missile would be located in a cluster of 23 HSSs. The area of the HSS is approximately 2 1/2 acres (1 hectare) and is fenced in a dodecagon shape (Figure 1-1). Other cluster-related facilities are the Cluster Road Network (CRN) to connect all shelters in a cluster, the Cluster Maintenance Facility (CMF) for routine maintenance of the missile, the separate Transporter and Erector Launcher (TEL); and a barrier separating the CRN and the Designated Transportation Network (DTN) road to restrict the entry/exit of the TEL to a cluster.

Initially, the Remote Surveillance Site (RSS) was a cluster-related facility. Although sited in the Initial Operational Capability (IOC) field surveys, the RSS was deleted on 7 January 1981 as directed by Ballistic Missile Office (BMO) (U. S. Department of the Air Force, BMO/AFRCE-MX, 1981). A DTN road serves to connect all clusters in the DDA to the Main Operating Base (MOB) and the Designated Assembly Area (DAA) to



REFERRENCE:

UNITED STATES DEPARTMENT OF THE AIR FORCE, BMO/AFRCE-MX, 1980b

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CONCEPTUAL CLUSTER AND HORIZONTAL SHELTER SITE

30 NOV 81 FIGURE 1-1

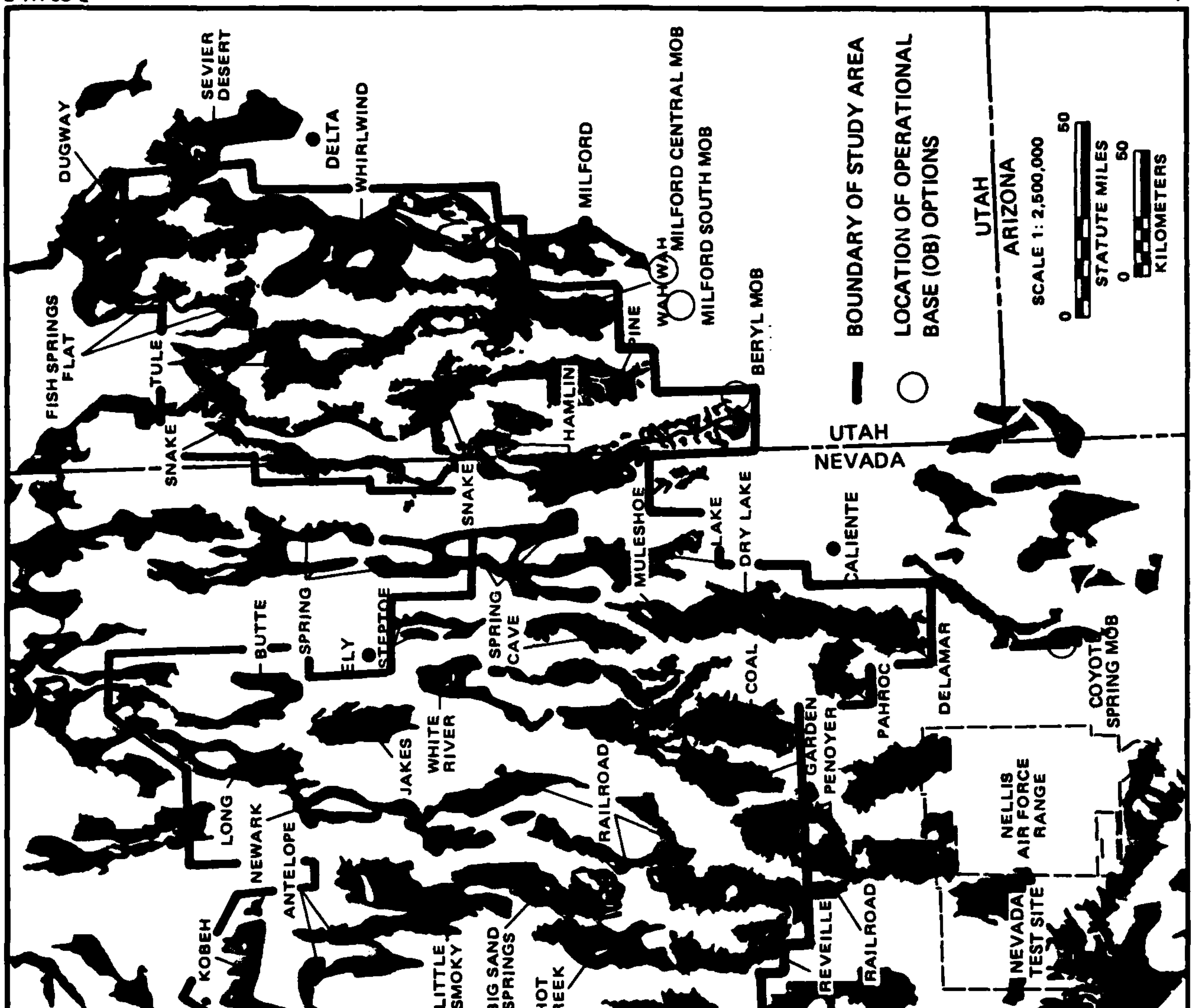
form the total MX system, (U.S. Department of the Air Force, BMO/AFSC, 1980).

This section includes a description of the study area and a review of previous activities. Sections 2.0 and 3.0 will present an overview of the siting process including the objectives, the scope of study, and the siting requirements used, along with the methodology for site selection and production of conceptual layouts. A regional summary of the HSS siting area and layout development, as of the end of FY 81, are presented in Section 4.0. Section 5.0 contains conclusions and comments based on the studies to date.

1.1 STUDY AREA

The proposed Nevada/Utah DDA is located in the Great Basin section of the Basin and Range physiographic subprovince in central Nevada and west-central Utah. The physiography is controlled by north-south trending, elongated mountain ranges separated by alluviated valleys. The 37 valleys in the study area (Figure 1-2) average between 50 and 100 miles (80 and 161 km) in length and between 5 and 15 miles (8 and 24 km) in width. Valley floor elevations range from 4300 to 7600 feet (1311 to 2316 m) in the DDA.

The geology of the area is dominated by sedimentary and igneous rocks ranging in age from Precambrian to Quaternary and by unconsolidated sediments of Quaternary age. The mountain ranges are eroded remnants of uplifted fault blocks separated by down-dropped basins. Almost all the valleys are closed



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MPS/HSS STUDY AREA
NEVADA/UTAH

30 NOV 81 FIGURE 1-2

basins with gently sloping alluvial surfaces grading toward a central playa. Playas, dunes, and alluvial fans are common landforms in the valleys. The low annual rainfall accounts for the paucity of perennial streams, rivers, and lakes. Vegetation consists of sage and low brush on the valley floors with cottonwoods, junipers, and piñon pines occurring where precipitation is more plentiful.

1.2 BACKGROUND

In Fiscal Year 1979 (FY 79), initial shelter siting studies began using Dry Lake Valley, Nevada, as a sample area. In early FY 80, a preliminary layout evaluation report was produced (Fugro National, Inc., 1980a). Layouts were depicted at scales of 1:4800 and 1:9600 using the "Verifiable Horizontal MPS Concept." These layouts represented a first attempt at the depiction of this concept while considering detailed terrain and geotechnical conditions. The methodologies developed were continued throughout the program.

During FY 80, shelter siting activities were expanded to include the development of various conceptual cluster layouts with a DTN at a scale of 1:62,500 for all valleys in the Nevada/Utah DDA.

Late in FY 80, revised shelter layouts on 1:9600 scale topographic maps were produced for Dry Lake Valley, Nevada, and in progress for Pine and Wah Wah valleys, Utah. These maps were used to support the field surveys in the above IOC valleys.

1.3 OBJECTIVES

The overall objectives of this study are: 1) complete integrated conceptual layouts for shelters in the DDA, 2) provide input for follow-on environmental assessments and field surveys, 3) produce documents which support the land acquisition process, and 4) support the Water Resources Program to determine the preliminary water requirements needed per valley for valley construction by providing conceptual layouts. These estimates became the basis for determining the quantity of water applied for in the water appropriation process.

1.4 TEMPORAL CONSTRAINTS

At the start of the MPS/HSS siting program, siting data required to produce the conceptual layouts were not available at the same level of detail for all 37 valleys of the DDA. However, this constraint does not diminish the usefulness of the conceptual layout in terms of the siting effort, tiering, or land acquisition. The application of the overall siting methodology does result in a conceptual layout which represents the best system model available considering the information at the time. Any large program needs time for tasks to be completed, yet faces decisions which need to be resolved before all the tasks are completed. Although the MPS/HSS basing mode evaluations were not completed, the overall indications were that the methodology was sound. Because the MPS/HSS siting effort did not run its full course, the siting summary presented here discusses the methodology and program results only until the end of FY 81.

2.0 SITING REQUIREMENTS

The BMO/AFRCE-MX (1980) issued the "MX Site Layout Requirements for a Horizontal Shelter with Separate Transporter and Erector Launcher System-Nevada/Utah" on 6 June 1980. This entire document is included in Appendix A; the major geometric and spatial shelter siting requirements defined in this document are:

- 5200-foot (1524-m) spacing;
- 2/3-filled hexagonal pattern;
- Relative angle between neighboring shelters: nominal 60°, minimum 55°;
- 23 shelters with 11 or 12 backfills per cluster;
- Maximum of three near neighbors per shelter; and
- One CMF per cluster.

In addition to these basic requirements, there are a number of operational, geotechnical, environmental, and geographical requirements which can be divided into exclusions and considerations (Tables 2-1 through 2-4).

Shelters and CMFs are not to be sited in areas designated as "exclusions". Considerations are areas to be avoided as much as possible (to minimize impacts to the area/environment) when compiling a layout.

Subsequent MX baseline changes and Air Force directives have comprised the guidelines used to develop the conceptual MPS/HSS layouts during FY 81. A chronology of the siting requirement development is presented in Appendix B.

I. EXCLUSIONS:

Quantity Distance (QD) Standoff:

- Existing road with an average daily traffic (ADT) greater than 50 vehicles per day: 2965 feet from centerline of road to HSS and CMF
- Inhabited buildings: 2956 feet from CMF and HSS
- Pipelines: 300 feet
- Above ground Petroleum Oils, Lubricants (POL): 1800 feet
- Radio, microwave facilities: 2965 feet from CMF and HSS
- Power generating facilities:

Cluster roads cannot coexist with or cross federal, state, and county roads with an ADT of 250 vehicles per day

II. CONSIDERATIONS:

Power line; QD to all MX facilities:

- Less than 50 kV : 750 feet
- 50 kV to 250 kV: 1250 feet
- More than 250 kV: 2500 feet

Power lines; QD to manned MX facilities with radio communications facilities:

- Less than 45 kV: 100 feet
- 45 kV and greater: 5000 feet

Cluster Siting:

- Clusters to be located so as to minimize the number of inhabited buidlings within the QD zones
- Clusters should be reasonably close to other clusters in the DDA
- Locate clusters in areas with a minimum of medium to tall vegetation

Cluster Roads:

- Site MPSs to permit the CRN to be oriented north to south to the greatest extent possible
- The CRN may coexist with or cross roads with an ADT less than 250 vehicles per day
- Minimize environmental impact by coexisting with upaved county roads of all other factors are equal
- The CRN may cross from one siting areas to another through unsuitable area as long as slope requirements and environmental exclusions are not violated
- Slope requirements:

  Nominal trunk and spur grades: maximum three percent

  MPS access ramp grade: maximum five percent

  Occasional grades of five percent may exist for a maximum of 500 feet sections
- The CRN for a cluster will be separate from any other cluster

Operational Support Roads (OSRs):

- May connect CRNs, but shall preclude STV or TEL entrance or exit
- Slope requirement: maximum 10 percent grade

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SHELTER SITE SELECTION
OPERATIONAL REQUIREMENTS

30 NOV 81 TABLE 2-1

I. EXCLUSIONS:

- Outcropping or shallow rock
- Surface slope greater than 10 percent
- Adverse terrain (two or more drainages 10 feet deep within 1000 feet)
- Standing water, swamps, or perennial streams
- Depth to rock less than 50 feet (i.e., material with a seimic velocity of 7000 fps)
- Depth to water less than 50 feet (i.e., first encountered water)
- Active playas

II. CONSIDERATIONS:

- Fault-rupture hazard
- Potential sheet wash
- Surface slope greater than five percent
- Dunes
- Desiccation cracks
- Tufa
- Boulder fields

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SHELTER SITE SELECTION
GEOTECHNICAL REQUIREMENTS

30 NOV 81

TABLE 2-2

I. EXCLUSIONS:

- Designated wilderness areas
- Wilderness study areas
- Existing/proposed federal and state
  - Wildlife refuges, archaeological areas
- Existing/proposed national
  - Wildlife refuges, preserves, registered archaeological properties
- Federal threatened and endangered species
- Non-attainment air quality areas

II. CONSIDERATIONS

- Federal and state proposed threatened and endangered species
- Locally identified "sensitive" areas
  - Environmentally
  - Socio-Enconomically
- Visual Resources

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SHELTER SITE SELECTION
ENVIRONMENTAL REQUIREMENTS

30 NOV 81 TABLE 2-3

I EXCLUSIONS:

- Existing/proposed federal and state:
  - Parks, landmarks, refuges, monuments, forests, recreational areas
- Existing/proposed national:
  - Grasslands, Indian reservations, ranges, military ranges (training areas, proving grounds, test site), registered historic properties
- Radii from population centers:

  20 statute miles from cities of 25,000 or more
  3.5 statute miles from cities of 5000 to 25,000
  1 statute mile from cities of less than 5000
- Inhabited buildings
- Industrial complexes:
  - Active mining areas, tank farms, pipeline complexes
- "High" potential mineral areas: *
  - Oil and gas fields, active and potentially active mining areas, strippable coal, oil shale, uranium deposits, known geothermal resource areas
- COE recommended exclusions

II CONSIDERATIONS:

- Private property
- State property
- "Good" potential mineral areas: *
  - Oil and gas, active and potentially active mining areas, strippable coal, oil shale, uranium deposits, known geothermal resource areas
- Irrigated farm land
- Prime agricultural land
- Moapa Indian Expansion Area
- Duckwater Indian Expansion Area
- Ranch and grazing allotments
- Existing access roads
- Proposed utility corridors

* Mineral potential to be determined by a study as required by FLPMA

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SHELTER SITE SELECTION
GEOGRAPHICAL REQUIREMENTS

30 NOV 81

TABLE 2-4

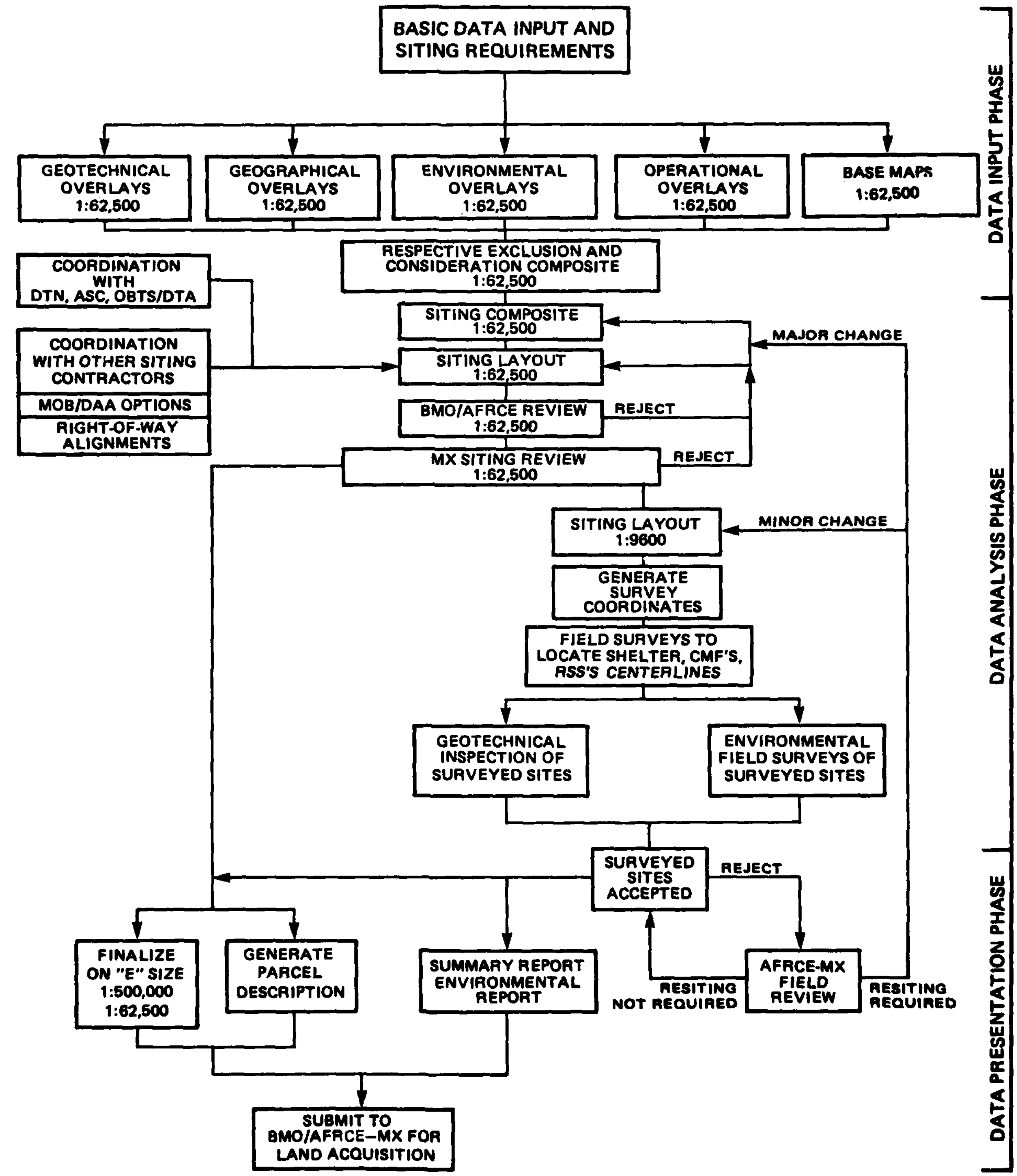
3.0 SITING METHODOLOGY

The siting methodology was the vehicle for applying the siting requirements to develop conceptual layouts, support tiering, and the land acquisition application. A methodology flow chart for shelter site selection is depicted in Figure 3-1. The process shown in this chart includes the following major activities.

- Determine the siting area based on verified geotechnical data, collected geographic data, and furnished environmental data;
- Produce conceptual layouts within the 37-valley DDA which could be used to initiate design studies and to limit these studies to specific sites and corridors;
- Determine the total size of the DDA to aid in the system planning of the entire MX system;
- Submit layouts for review by BMO/AFRCE-MX;
- Perform field surveys for the IOC cluster facilities and alignments;
- Support the tiered decision making process; and
- Provide conceptual layouts and parcel descriptions for the land acquisition application.

The basic data input encompassed the BMO/AFRCE-MX siting requirements and the siting data. Generally, the siting requirements called for compliance to existing federal laws and Air Force policies. Geometric and spatial aspects, as well as operational constraints, were also indicated.

The layout team integrated data which had been previously collected, compiled, reduced/analyzed, and presented in map form.



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METHODOLOGY FLOW CHART
MPS/HSS LAYOUT
SITE–SELECTION PROCESS

30 NOV 81

FIGURE 3-1

Application of the resulting exclusionary map overlays to a potential siting area eliminated the unsuitable areas, leaving an area that meets the siting requirements. Layout compilation was the analytic process of applying the siting requirements to develop a schematic layout based on the spatial distribution of the siting factors.

Review of the conceptual layouts were of two general types, MX technical/operational and policy/environmental. The technical/operational reviews were regarded as being "in-house" (Air Force and MX contractors) while the policy/environmental reviews involved other federal/state government agencies, local/tribal governments, and civic groups. These reviews were a part of the tiered decision-making process which gave rise to the acceptance or revision of the conceptual layouts to be used for the land acquisition application.

Discussion of the siting methodology is subdivided into four primary areas of concern:

1. Defining the siting area using base maps and map overlays;
2. Developing the conceptual layouts;
3. Performing field surveys; and
4. Coordinating system siting reviews, compilation of the land acquisition application package, and participating in interchange meetings.

The following discussions are general to emphasize the overall siting methodology. The details of the application of this methodology to the Nevada/Utah DDA will follow in Section 4.0 of this report.

3.1 DEFINING THE SITING AREA

Prior screening studies had eliminated much of the conterminous United States from consideration for MPS/HSS basing. The following discussion pertains to refinement of the siting area from a regional size (i.e., Candidate Siting Region [CSR]) to a valley size (i.e., an average suitable area of about 280 mi^2 [725 km^2]). The definition of the geotechnically suitable area which could be considered for siting (i.e., developing) conceptual layouts was derived by expressing the siting requirements as quantifiable mapping units. The data collection and analyses were completed by other technical groups. The following discussion will focus on the compilation of base maps and the use of map overlays in the siting process.

3.1.1 Base Maps

The integration of the siting data was coordinated by the use of a standard set of base map scales. The base maps were derived from available U.S. Geological Survey (USGS) maps and Ertec Airborne Systems, Inc. (Ertec Airborne) maps produced for selected areas. Table 3-1 summarizes the source agency, map series scale, and projections used by Ertec. The scales selected for use in Ertec siting studies were 1:500,000 (regional maps and "E" format), 1:62,500 (general valley maps and "E" format), and 1:9600 and 1:4800 (detailed valley maps).

The regional map scale of 1:500,000 was chosen as a convenient display scale to show the entire Nevada/Utah DDA. Two different USGS map series were used: 1) the State Base Map

BASE MAP SERIES	PUBLISHED SCALE	MAP PROJECTION USED
USGS STATE	1: 500,000	LAMBERT CONFORMAL
2° QUADRANGLE	1: 250,000	UNIVERSAL TRANSVERSE MERCATOR
15' QUADRANGLE 7½' QUADRANGLE	1: 62,500 1: 24,000	NV: TRANSVERSE MERCATOR UT: LAMBERT CONFORMAL NV/UT: POLYCONIC[1]
ERTEC AIRBORNE SYSTEMS, INC. ERTEC AIRBORNE SYSTEMS, INC.	1: 62,500 1: 9600	NV: TRANSVERSE MERCATOR UT: LAMBERT CONFORMAL
ERTEC AIRBORNE SYSTEMS, INC.	1: 4800	NV: TRANSVERSE MERCATOR

NOTES:
1. ALL MAP PROJECTIONS ARE CONFORMAL WITH THE EXCEPTION OF THE POLYCONIC PROJECTION WHICH IS NEITHER CONFORMAL NOR EQUAL AREA

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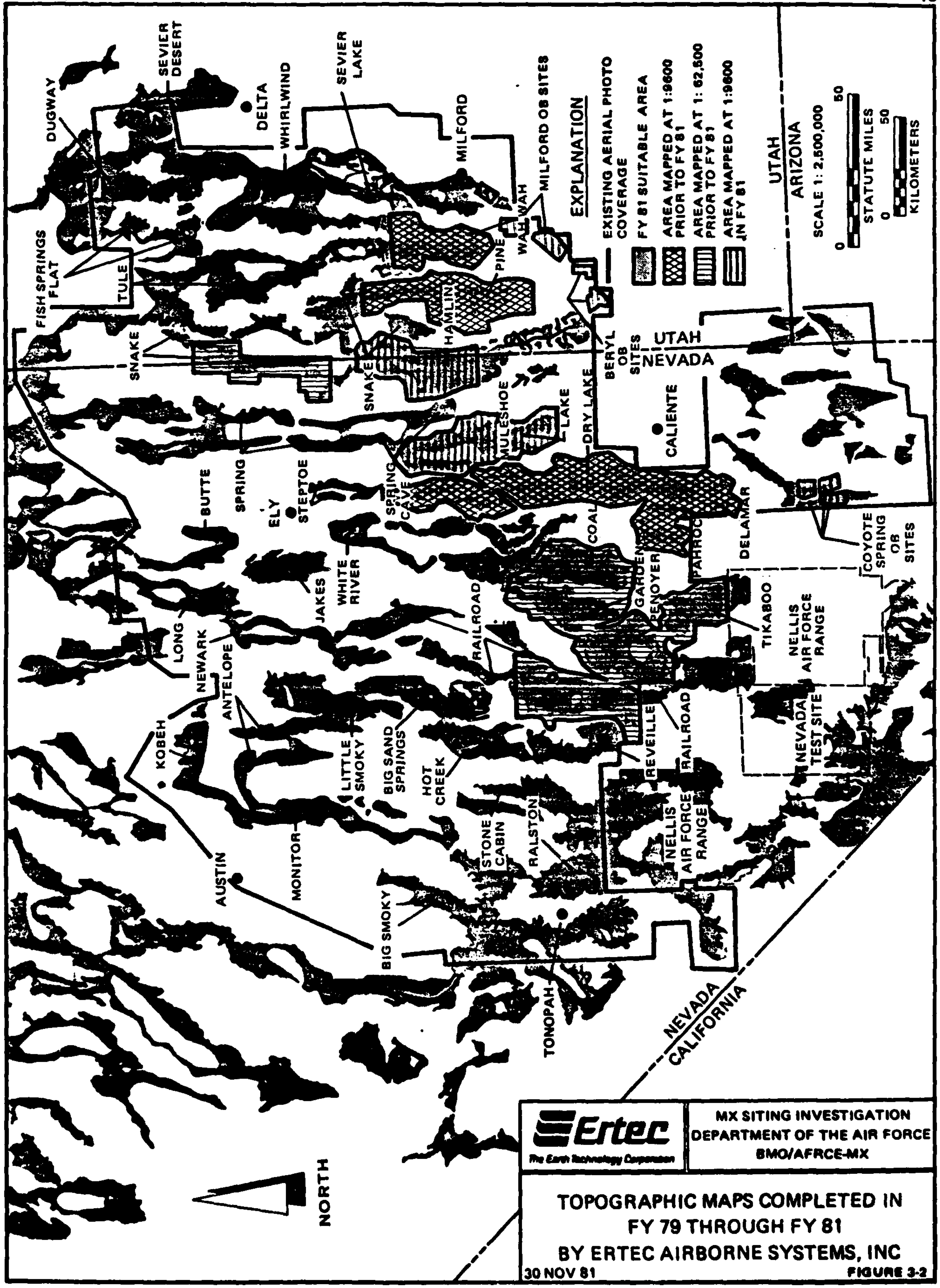
BASIC CHARACTERISTICS OF SOURCE MAPS USED TO DEVELOP BASE MAPS BY ERTEC

30 NOV 81 TABLE 3-1

series, and 2) the 1:250,000 scale topographic quadrangle (topo quad) series. Compilation of the individual 1:250,000 map sheets into a single regional map sheet was accomplished by photographic reduction and compositing. Reduced 1:250,000 scale base maps were used in most of the recent regional deliverables to AFRCE-MX. Drawing 3-1 is a sample regional map. A regional "E" format base map was also produced. The production of the "E" format is discussed later in this section.

Developing the 1:62,500 scale base maps for the general valley coverage resulted in a scale compromise. The most frequently available scale USGS topo quads were 1:24,000 followed by 1:62,500 and 1:250,000. The 1:250,000 scale did not have adequate topographic detail needed for site-specific siting. The 1:62,500 scale was the intermediate scale of the maps available and provided sufficient detail for both office and field studies.

In order to obtain full map coverage, the USGS maps were photographically reduced, copied, or enlarged to approximately 1:62,500 scale and then spliced together to form valley map work sheets in late FY 78. For selected areas which were not covered by 1:24,000 or 1:62,500 USGS maps, Ertec Airborne produced 1:62,500 topographic maps (Figure 3-2). The remainder of the area was filled in using 1:250,000 base maps photographically enlarged to 1:62,500. The USGS 1:100,000 metric quadrangle series were in initial stages of production in early FY 81. Besides their unavailability, they were not used in the



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TOPOGRAPHIC MAPS COMPLETED IN FY 79 THROUGH FY 81 BY ERTEC AIRBORNE SYSTEMS, INC

30 NOV 81 FIGURE 3-2

base map compilation process because the contour intervals (metric) were not compatible with the other base map series. A tabulation of the USGS and Ertec Airborne maps used is presented in Appendix C. Valley base maps (1:62,500) were produced for the Nevada/Utah DDA valleys listed in Table 3-2. Drawing 3-2 is a sample valley base map.

As an element of the land acquisition application, another series of 1:62,500 scale base maps were prepared to fit "E" sized map sheets (36 inches x 48 inches [91 x 122 cm], horizontal format). The scale was selected to be compatible with the conceptual layout, and the size of the map sheets permitted them to be mounted on commonly used computer plotters. It was concluded that the standard size sheet of the "E" format enabled the full coverage of the DDA to be easily handled as a package.

The DDA was gridded into cells 22 1/2' of latitude by 45' of longitude. The origin of the grid was 39°N latitude, 114°W longitude. The parallel 39°N was selected as being nearly central to the north-south extent of the DDA. The meridian 114°W was chosen because it represents the boundary between Universal Tranverse Mercator (UTM) zones 11 and 12. Figure 3-3 depicts the "E" format index map relative to the Nevada/Utah DDA. A total of 62 map sheets were needed. Consideration for the UTM zone continuity was important because other MX contractors were maintaining digital files using UTM coordinates.

UTAH		1:62,500	1:9600	1:4800	"E" SIZE
1. DUGWAY	DW	●			●
2. FISH SPRINGS FLAT	FS	●			●
3. PINE	PI	●	●		●
4. SEVIER DESERT	SD	●			●
5. SEVIER LAKE	SL	●			●
6. SNAKE	SV	●			●
7. TULE	TL	●			●
8. WAH WAH	WA	●	●		●
9. WHIRLWIND	WW	●			●
	UT SUBTOTAL	9	2		9

NEVADA					
1. ANTELOPE	AN	●			●
2. BIG SAND SPRINGS	BG	●			●
3. BIG SMOKY	BS	●			●
4. BUTTE	BV	●			●
5. CAVE	CV	●	●		●
6. COAL	CL	●			●
7. DELAMAR	DM	●	●		●
8. DRY LAKE	DL	●	●	●	●
9. GARDEN	GN	●			●
10. HAMLIN	HV	●	●		●
11. HOT CREEK	HC	●			●
12. JAKES	JV	●			●
13. KOBEH	KB	●			●
14. LAKE	LV	●	●		●
15. LITTLE SMOKY	LS	●			●
16. LONG	LG	●			●
17. MONITOR	MV	●			●
18. MULESHOE	MS	●	●		●
19. NEWARK	NK	●			●
20. PAHROC	PA	●	●		●
21. PENOYER	PN	●			●
22. RAILROAD	RR	●			●
23. RALSTON	RV	●			●
24. REVEILLE	RE	●			●
25. SPRING	SP	●			●
26. STEPTOE	SO	●			●
27. STONE CABIN	ST	●			●
28. TIKABOO	TK	●			
29. WHITE RIVER	WR	●			●
	NV SUBTOTAL	29	7	1	28
	TOTAL	38	9	1	37

NOTE: "E" SIZE MAP SHEETS WERE 36" X 48" HORIZONTAL FORMAT AT 1:62,500 MAP SCALE

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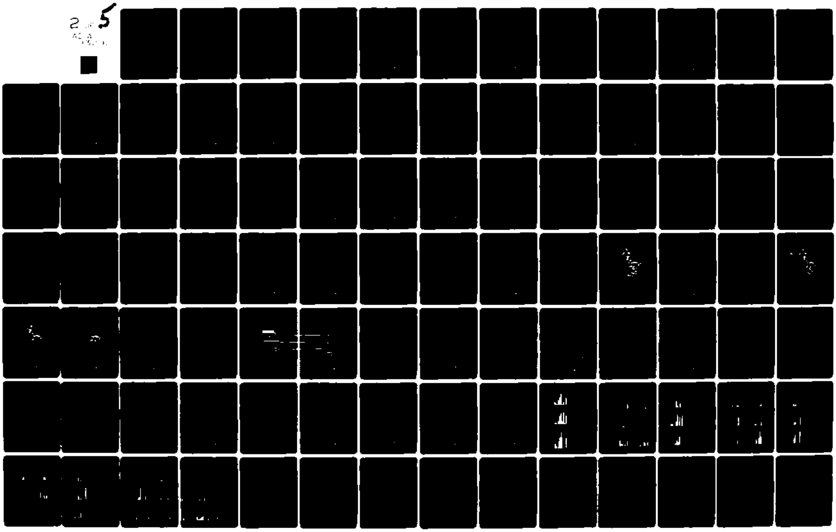
SUMMARY OF BASE MAP SCALES COMPILED BY ERTEC

30 NOV 81

TABLE 3-2

AD-A113 216 ERTEC WESTERN INC . LONG BEACH CA F/G 16/1
MX SITING INVESTIGATION. MX SYSTEM SITING SUMMARY REPORT. GENER--ETC(U)
JAN 82 F04704-80-C-0006
UNCLASSIFIED E-TR-58-VOL-1 NL

2 of 5



A
32

UTAH		1:62,500	1:9600	1:4800	"E" SIZE
1. DUGWAY	DW	●			●
2. FISH SPRINGS FLAT	FS	●			●
3. PINE	PI	●	●		●
4. SEVIER DESERT	SD	●			●
5. SEVIER LAKE	SL	●			●
6. SNAKE	SV	●			●
7. TULE	TL	●			●
8. WAH WAH	WA	●	●		●
9. WHIRLWIND	WW	●			●
	UT SUBTOTAL	9	2		9

NEVADA		1:62,500	1:9600	1:4800	"E" SIZE
1. ANTELOPE	AN	●			●
2. BIG SAND SPRINGS	BG	●			●
3. BIG SMOKY	BS	●			●
4. BUTTE	BV	●			●
5. CAVE	CV	●	●		●
6. COAL	CL	●			●
7. DELAMAR	DM	●	●		●
8. DRY LAKE	DL	●	●	●	●
9. GARDEN	GN	●			●
10. HAMLIN	HV	●	●		●
11. HOT CREEK	HC	●			●
12. JAKES	JV	●			●
13. KOBEH	KB	●			●
14. LAKE	LV	●	●		●
15. LITTLE SMOKY	LS	●			●
16. LONG	LG	●			●
17. MONITOR	MV	●			●
18. MULESHOE	MS	●	●		●
19. NEWARK	NK	●			●
20. PAHROC	PA	●	●		●
21. PENOYER	PN	●			●
22. RAILROAD	RR	●			●
23. RALSTON	RV	●			●
24. REVEILLE	RE	●			●
25. SPRING	SP	●			●
26. STEPTOE	SO	●			●
27. STONE CABIN	ST	●			●
28. TIKABOO	TK	●			
29. WHITE RIVER	WR	●			●
	NV SUBTOTAL	29	7	1	28
	TOTAL	38	9	1	37

NOTE: "E" SIZE MAP SHEETS WERE 36" X 48" HORIZONTAL FORMAT AT 1:62,500 MAP SCALE

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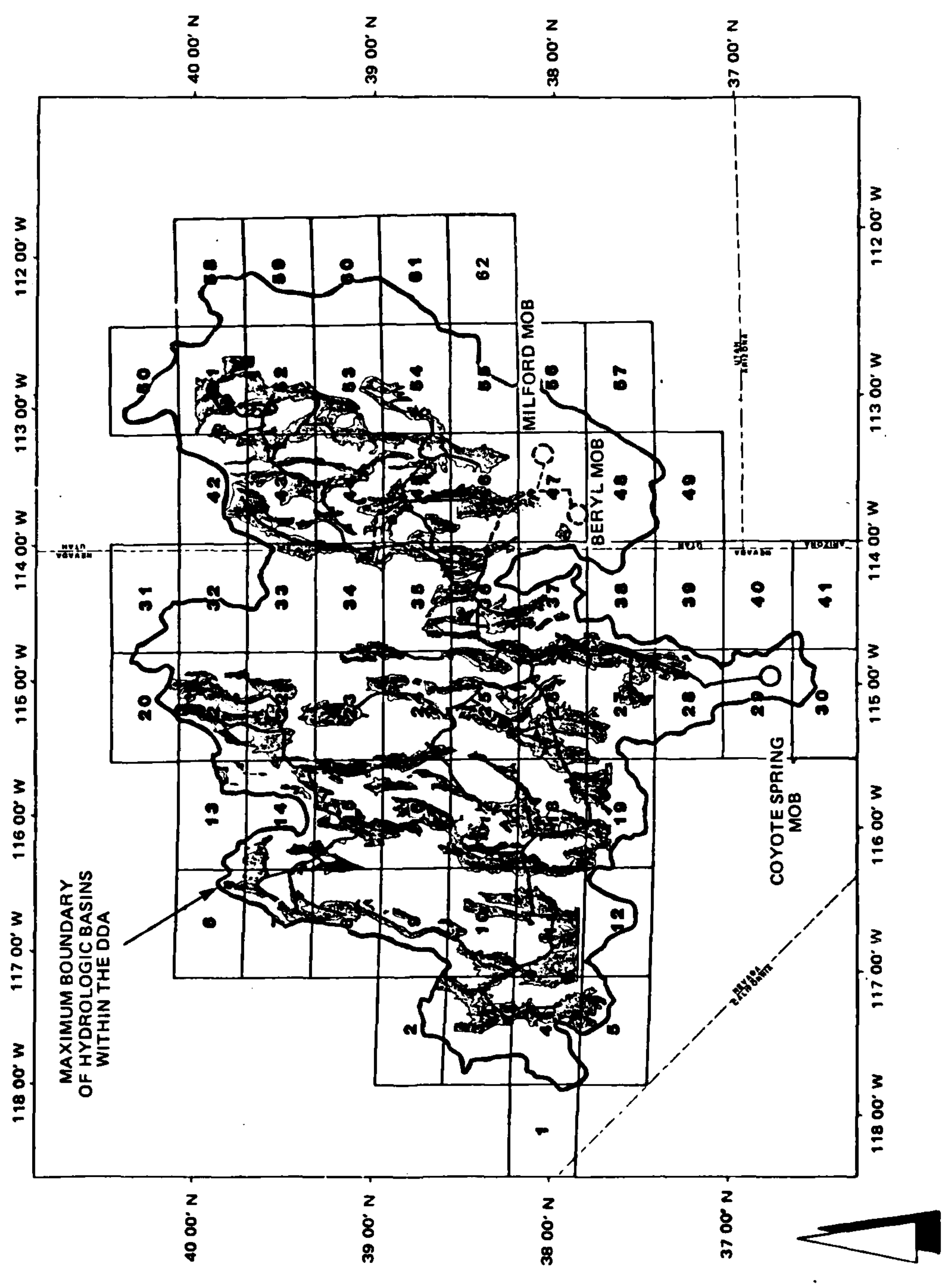
SUMMARY OF BASE MAP SCALES COMPILED BY ERTEC

30 NOV 81

TABLE 3-2



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'E' SIZED (1:62,500) BASE MAP INDEX
DESIGNATED DEPLOYMENT AREA (DDA)
NEVADA/UTAH

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FIGURE 3-3

The source maps for the "E" format were the same as the general valley base maps except where updates were available. Splicing was performed from the center of the map edges outward to maintain scale control. Drawing 3-3 is a sample "E" format map sheet.

Detailed valley maps at the scale of 1:9600 were produced by Ertec Airborne. The term "detailed" is used here to differentiate these maps from the less detailed 1:62,500 scale maps. Maps at a larger scale (more detailed) would have been required if the MPS basing mode had continued to the design stage. Prior studies (Fugro National, Inc., 1980a) using 1:4800 and 1:9600 scale maps indicated that 1:9600 provided adequate detail to make the transition from conceptual layouts (1:62,500 scale) to the more detailed scale needed for site-specific investigations. The 1:9600 maps depicted 10-foot (3-m) contour intervals and were produced by stereo photogrammetric compilation techniques using 1:25,000 scale color aerial photography. The maps were referenced to the appropriate state plane coordinate system and a datum elevation of mean sea level. The legal land net data were obtained from USGS quadrangle sheets and verified by BLM "Protraction Survey Plots". Table 3-2 lists the valleys mapped at 1:9600 and 1:4800 scales. Sample detailed valley 1:9600 and 1:4800 scale maps are presented as Drawings 3-4 and 3-5, respectively.

3.1.2 Map Overlays

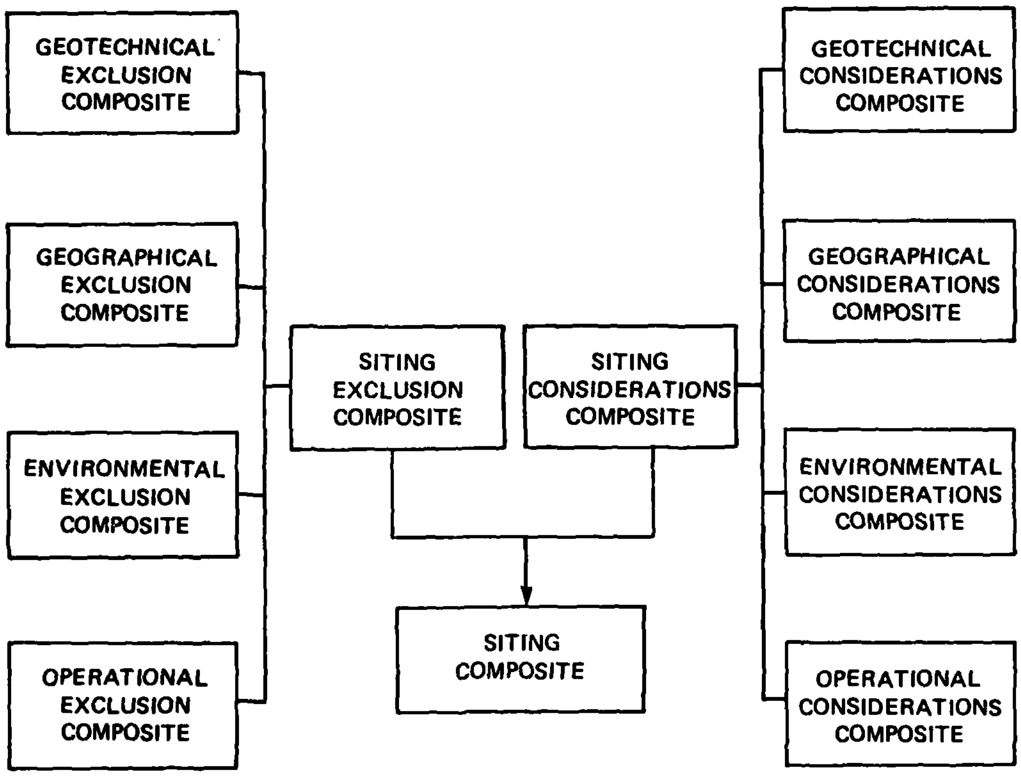
Each technical discipline compiled their respective data on mylar overlays which were registered to the general valley base maps (1:62,500 scale). The overlays generally depicted a single theme or group of related themes (e.g., 10 percent and five percent slope; rock/non-rock contact, 50-foot [15-m] depth to rock, 50-foot [15-m] depth to water). The composites were updated as new data became available or as dictated by changes in the siting requirements.

Composite overlays depicting the siting exclusions and considerations were submitted to the siting group by the technical groups (Figure 3-4). The maximum areal extent of the siting area is delimited by the suitable area remaining after combining exclusion composites. The considerations indicate the trade offs which can be made. Due to the variable and vague nature of these considerations, trade-off decisions are not always clear cut. The use of map overlays permitted the study of the spatial relationships of these various factors in developing the conceptual layouts.

3.2 DEVELOPMENT OF CONCEPTUAL LAYOUTS

The evolving nature of the siting requirements resulted in a division of layout work into research and development (R&D) and production tasks. This section will focus on the R&D activities. The production activities will be covered in Section 4.0.

The generation of a conceptual layout serves as initial input to the review process. The emphasis or change of emphasis regarding a particular consideration factor or group of factors



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GENERALIZED FLOW CHART:
DETERMINATION OF THE SITING AREA

30 NOV 81 FIGURE 3-4

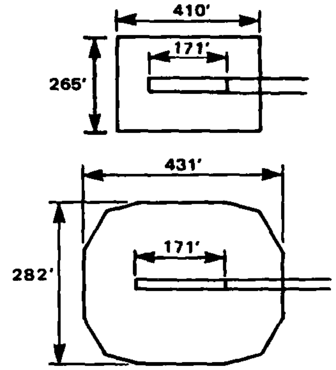
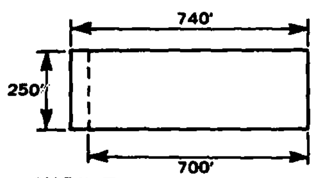
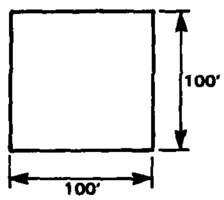
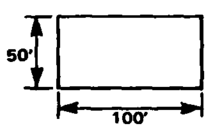
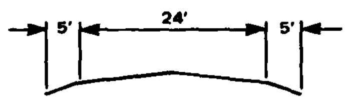
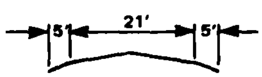
may require adjustments in the layout. Records documenting these trade-offs would accompany the conceptual layout during the review process.

The full documentation of the resulting layout and the considerations made form the basis of the Description of Proposed Actions and Alternatives (DOPAA). The DOPAA serves as the basic input to the environmental assessment process and tiering. This same layout is depicted on the "E" size map sheets and the facilities described as input into the land acquisition application package.

3.2.1 Implications of Map Scale

The conceptual layouts are spatial models of the system. As such, there are limitations imposed by map scale. A geographic valley was the areal unit selected for layout compilation. However, a valley is only a small segment of the MX system; thus, all valley layouts need to be viewed together at a regional scale. The siting studies were required to identify factors at both regional and "local" or site-specific (valley) levels.

On a more functional level, scale limitations manifest themselves in the graphic display. Table 3-3 summarizes the basic facilities being sited, their actual dimensions, and the corresponding map dimensions for the map scales used in the siting studies. Table 3-4 demonstrates the relationship of the graphic pen line widths to the same map scales. These tables

FACILITY	DIMENSION / SKETCH	MAP REPRESENTATION (IN INCHES) AT		
		1: 500,000	1: 62,500	1: 9600
MPS/HSS	 410' 171' 265' 431' 171' 282'	L .010*	.079	.513
		W .010*	.051	.331
		L .009*	.075	.489
		W .007*	.060	.387
CMF	 740' 250' 700' CMF WITHOUT POWER DIST CENTER	L .018	.142	.925
		W .006*	.048	.313
		L .017	.134	.875
RSS	 100' 100'	L .002*	.019	.125
		W .002*	.019	.125
BARRIER	 50' 100'	L .002*	.019	.125
		W .001*	.010*	.625
DTN	 5' 24' 5'	W .001*	.005*	.030
	ROADS HAVE 5' SHOULDER			
CRN	 5' 21' 5'	W .001*	.004*	.026

* INDICATES MEASUREMENT TO BE LESS THAN 1/64" AND CANNOT BE ACCURATELY SCALED AT THE GIVEN MAP REPRESENTATION

1" = 1.0"
1/2" = 0.5"
1/4" = 0.25"
1/8" = 0.125"
1/16" = 0.0625"
1/32" = 0.03125"
1/64" = 0.015625"

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DIMENSIONS OF MPS/HSS CLUSTER FACILITIES

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GROUND DIMENSIONS (IN FEET) OF LINE WEIGHTS FOR
TECHNICAL DRAFTING PENS

GRAPHIC EXAMPLE OF PEN SIZE	METRIC PEN SIZE (MM)	GROUND DIMENSION (IN FEET) AT DESIGNATED MAP SCALE			
		1: 500,000	1: 62,500	1: 9600	1: 4800
	2.0	3937.0	410.1	62.9	31.40
	1.4	2296.6	287.1	44.1	22.04
	1.0	1640.4	205.1	31.5	15.74
	0.7	1148.3	143.5	22.1	11.02
	0.5	820.2	102.5	15.8	7.87
	0.35	574.2	71.8	11.0	5.50
	0.25	410.1	51.3	7.9	3.93

COMMON LINE WEIGHTS USED AT ERTEC WESTERN FOR LAYOUT DRAWINGS:

PEN SIZE	FACILITY
1.4 MM	DTN
0.5 MM	CRN

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RELATIONSHIP OF GRAPHIC LINE WEIGHTS TO MAP SCALES USED IN MX SITING STUDIES BY ERTEC

30 NOV 81 TABLE 3-4

reveal that if a 0.5 mm pen is used to indicate a CRN on a 1:62,500 scale map, the graphic representation makes the CRN 102.5 feet (31 m) wide rather than the actual 31 feet (9 m). This graphic "distortion" is necessary if the layout drawing is to be readable but can lead to problems of "misrepresenting" the actual ground location of the facilities. Fortunately, the conceptual layouts are used for planning, and this scale would not be used for design or construction. For their intended purpose, the layouts were deemed consistent with the map scales used.

3.2.2 Indexing and Coordinate References

The full MX system required 200 clusters of 23 shelters each. To systematically record pertinent siting data on each cluster, an indexing scheme was implemented which established a two-letter code for each geographic valley in the Nevada/Utah DDA (Table 3-5). Clusters within a valley would be assigned a sequential index number starting with the number 1. Cluster facilities would be indexed relative to the cluster in which they occur (e.g., CMF-1, would be the CMF in Cluster 1; Barrier-3 would be the barrier to Cluster 3). Shelters within a cluster would be numbered sequentially (i.e., in order as encountered traveling through the cluster) starting from number 1. Thus, an index label of CV 1-20 would translate to Cave Valley, Cluster 1, Shelter 20.

This indexing scheme provides flexibility in terms of changes in cluster counts. If each cluster was assigned a sequence

UTAH VALLEYS	ABBREVIATION
1. DUGWAY	DW
2. FISH SPRINGS FLAT	FS
3. PINE	PI
4. SEVIER DESERT	SD
5. SEVIER LAKE	SL
6. SNAKE	SV
7. TULE	TL
8. WAH WAH	WA
9. WHIRLWIND	WW

NEVADA VALLEYS	ABBREVIATION
1. ANTELOPE	AN
2. BIG SAND SPRINGS	BG
3. BIG SMOKY	BS
4. BUTTE	BV
5. CAVE	CV
6. COAL	CL
7. DELAMAR	DM
8. DRY LAKE	DL
9. GARDEN	GN
10. HAMLIN	HV
11. HOT CREEK	HC
12. JAKES	JV
13. KOBEH	KB
14. LAKE	LV
15. LITTLE SMOKY	LS
16. LONG	LG
17. MONITOR	MV
18. MULESHOE	MS
19. NEWARK	NK
20. PAHROC	PA
21. PENOYER	PN
22. RAILROAD	RR
23. RALSTON	RV
24. REVEILLE	RE
25. SPRING	SP
26. STEPTOE	SO
27. STONE CABIN	ST
28. TIKABOO	TK
29. WHITE RIVER	WR

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VALLEY ABBREVIATIONS

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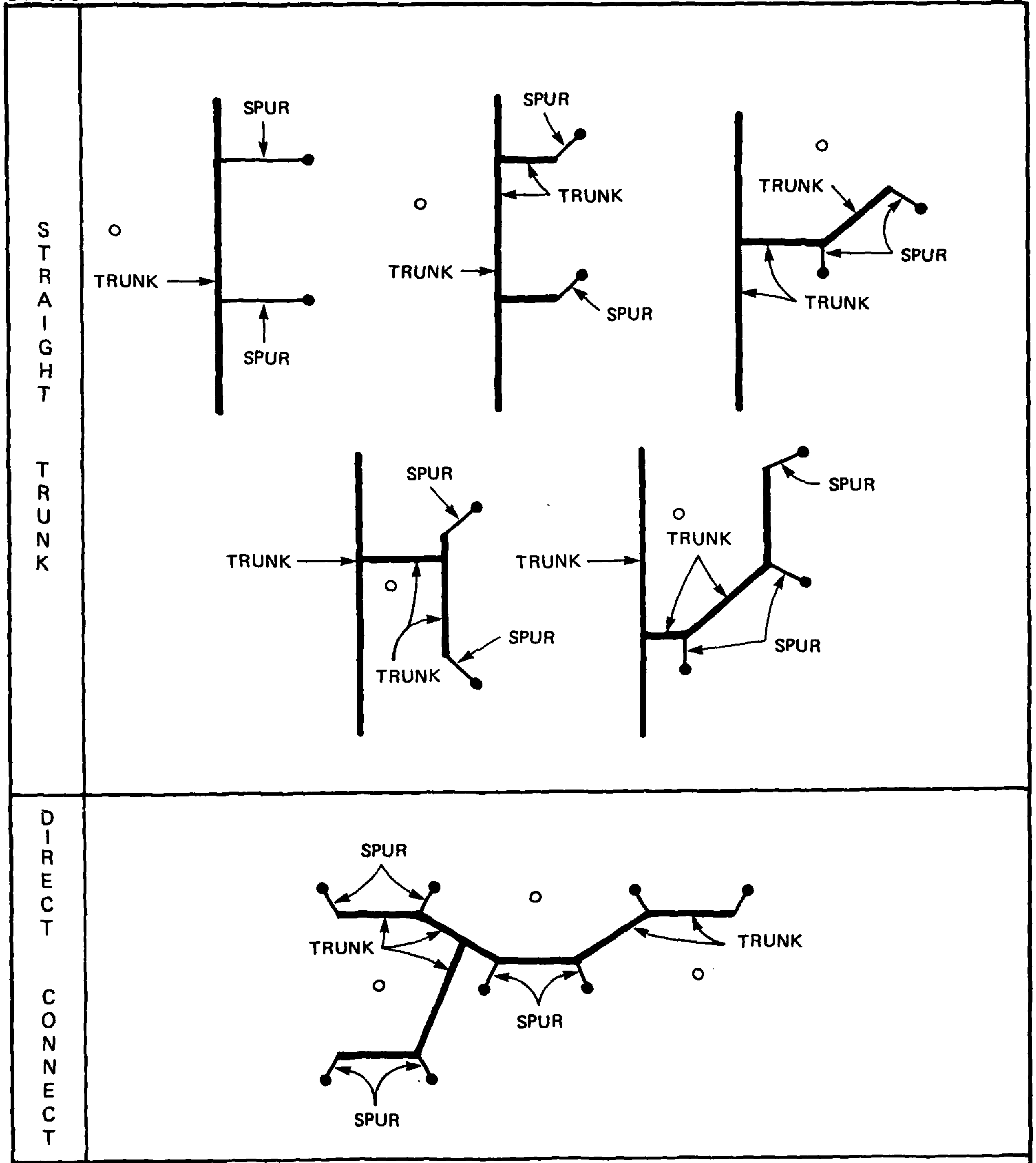
TABLE 3-6

number 1 to 200, the deletion of a cluster in a valley would disrupt the sequencing of cluster numbers. The substitute cluster would be geographically out of sequence and confusion in logistics would arise. By sequencing the cluster numbers within a valley, this geographic problem is averted.

The physical location of the facilities was given in the appropriate state plane coordinate system. This choice was made in deference to the fact that land parcel descriptions for cadastral surveys utilize this survey system. All orientations specified are also referenced to state plan grid north.

As with the cluster facilities, studies of various CRN configurations required in-house standardization of terms and procedures. Office tabulations of estimated CRN length followed the guidelines listed below.

- o The CRN lengths would be tabulated as basic straight line tangent segments without considering radii of curvature;
- o The CRN would be subdivided into the following components (Figure 3-5);
  - Trunk road - primary cluster artery forming the axis of the cluster;
  - Spur road - the ramp and any straight portion of road aligned with the ramp which connects the MPS or CMF to the trunk road; and
  - Entry road - the link between the DTN where blocked by the barrier and the CRN, to permit access of the STV and TEL to the cluster;
- o Standard lengths of spur roads were assigned based on Boeing report SMX-41934 (24 January 1981);
  - HSS spur = 1080 feet (329 m); and
  - CMF spur = 1069 feet (329 m);



Notes:

Trunk – Primary cluster artery forming the axis of the cluster

Spur – The ramp and any straight portion of road, aligned with the ramp which connects the MPS or CMF to the trunk road

● *Shelter*

○ Backfill

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CRN COMPONENTS

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FIGURE 3-5

o Entry roads were not tabulated since these would vary depending upon the cluster proximity to the DTN as well as the location of the barrier.

3.2.3 Basic MPS/HSS Geometry

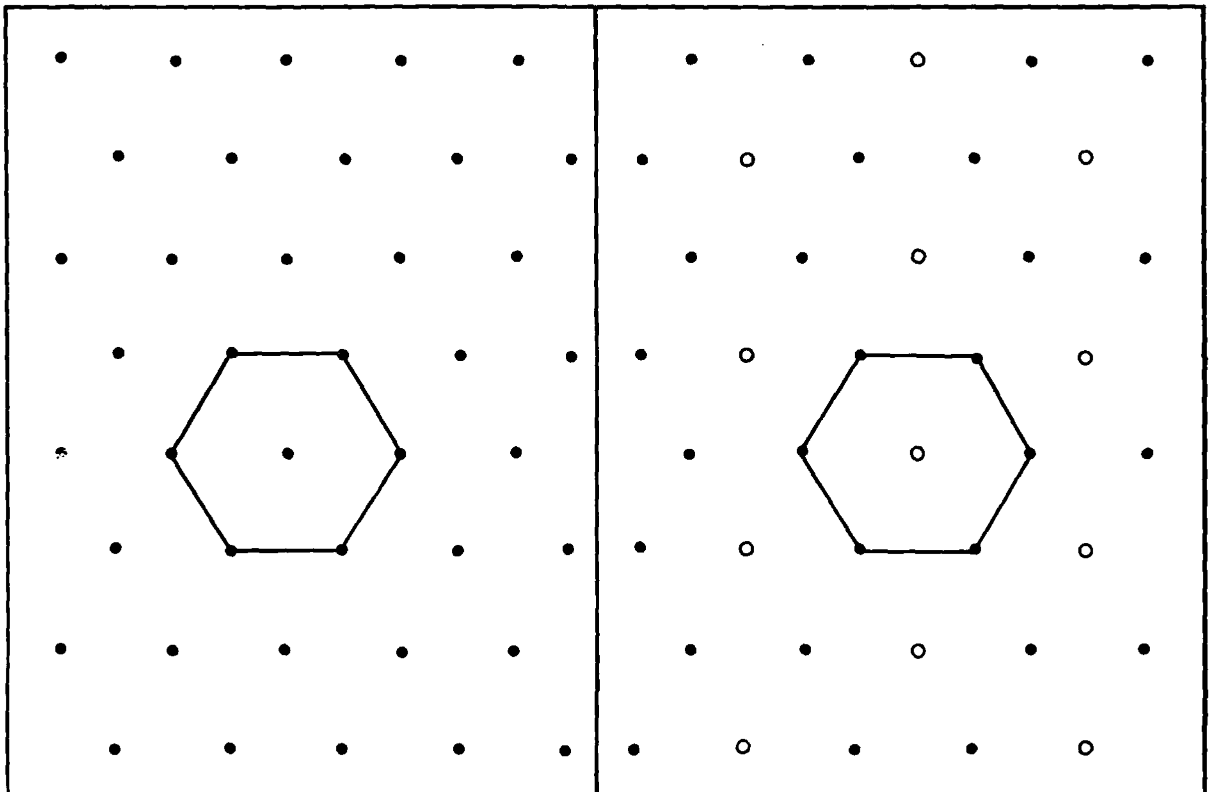
Having established the index and term standards, the geometry of the cluster components is discussed. The shelters are initially configured in a grid. A regular hexagonal grid was used for MPS/HSS siting. Figure 3-6 illustrates the difference between the full hexagonal and the 2/3-filled hexagonal patterns. A full hexagonal pattern utilizes all hexagonal cell perimeter and center points for shelters. The 2/3-hexagonal pattern uses hexagonal cell perimeter points for shelters and center points for backfills.

3.2.3.1 Spacing and Orientation

The straight line distance between two adjacent points (i.e., shelters) in the regular hexagonal grid becomes the spacing of that grid. The points located by the intersections of the guidelines forming the hexagonal cells represent the shelter doors. The specified spacing in the siting requirement is from shelter door to shelter door. By definition a regular hexagon is composed of equilateral triangles, thus the interior angles are 60°. The guidelines of the hexagonal grid provide a visual reference to orient the shelters in accordance to the siting requirement of a nominal 60° between neighboring shelters.

3.2.3.2 Near Neighbor

The position of any potential shelter site located in a regular hexagonal grid will have a maximum of three "near neighbors"



PATTERN EXPLANATION	
FULL HEXAGONAL	2/3-FILLED HEXAGONAL
ALL HEX CELL PERIMETER AND CENTER POINTS ARE POTENTIAL SHELTER SITES.	ALL HEX CELL PERIMETER POINTS ARE POTENTIAL SHELTER SITES; CENTER POINTS ARE POTENTIAL BACKFILL SITES
40 POINTS TOTAL ALL ARE POTENTIAL SHELTER SITES	40 POINTS TOTAL 28 POTENTIAL SHELTER SITES 12 POTENTIAL BACKFILL SITES

NOTES:
- ● POTENTIAL SHELTER SITE
- ○ POTENTIAL BACKFILL SITE

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COMPARISON OF FULL HEXAGONAL AND 2/3-FILLED HEXAGONAL PATTERNS

30 NOV 81 FIGURE 3-6

(Figure 3-7). A siting consideration was to maintain this situation. Working with plane surface schematic grids presents no problem in complying with this consideration. But distortions in the grid (Figure 3-8) creates situations which require careful monitoring of the layout compilation.

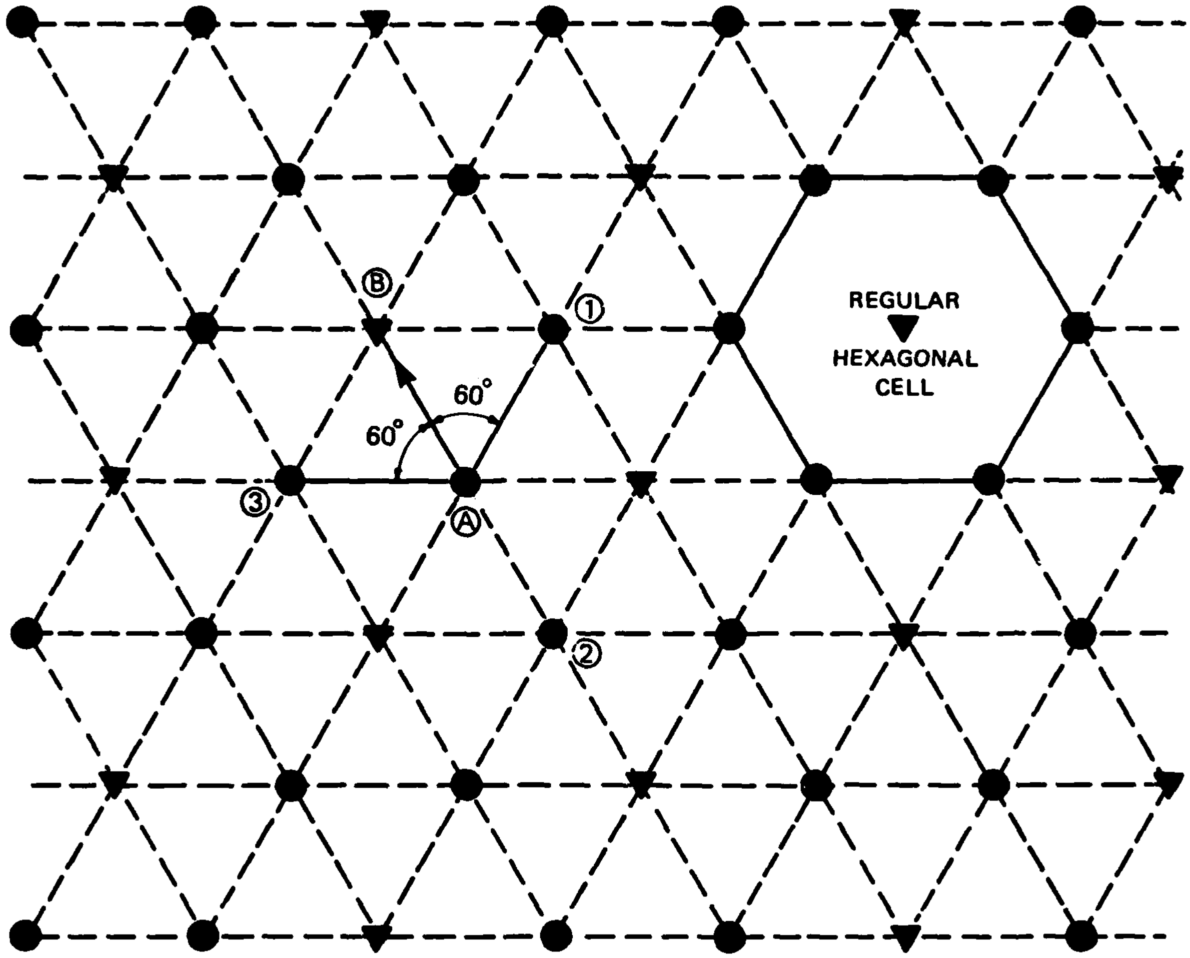
3.2.3.3 Modification of Quantity Distance (QD) Standoff Requirements

Realizing that the lines on the map actually represent a ground dimension, the layout compilation process required that graphic modifications be made to the QD standoffs. Figure 3-9 shows the basis for these modifications. The template grid point represents the protective structure "working point" (door).

The basic layout template relies on the grid points to locate the MPS/HSS. Some of the QDs specify "to the nearest part of the structure," while others were "to the nearest part of the fence." The modified QDs graphically account for the difference between the shelter door and the rear HSS fence line. The effect of this additional "graphic buffer" being added to the QD was to permit a safety margin to the layout process when working at intermediate map scales (1:62,500). This safety margin would also permit transferring a conceptual layout from 1:62,500 maps to 1:9600 maps with a minimum of scaling errors relative to the required QD standoffs. Figure 3-10 depicts the check template annotated with the modified QDs.

3.2.4 CRN Configurations

Once the shelters were sited, two basic CRN configurations were studied and utilized in compiling cluster layouts, loop and



NOTES:

A POTENTIAL PRIMARY MPS/HSS

B POTENTIAL BACKFILL LOCATION

1, 2, 3 POTENTIAL "NEAR NEIGHBORS" TO POINT A

ALIGNMENT FROM A TO B BECOMES AZIMUTH OF ORIENTATION FOR A. NO OTHER SHELTER CAN BE SITED 60° TO EITHER SIDE OF THIS AXIS.

ALL ▼ ARE POTENTIAL BACKFILLS

ALL ● ARE POTENTIAL MPS/HSSs

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SAMPLE HEXAGONAL TEMPLATE
1: 62,500 SCALE

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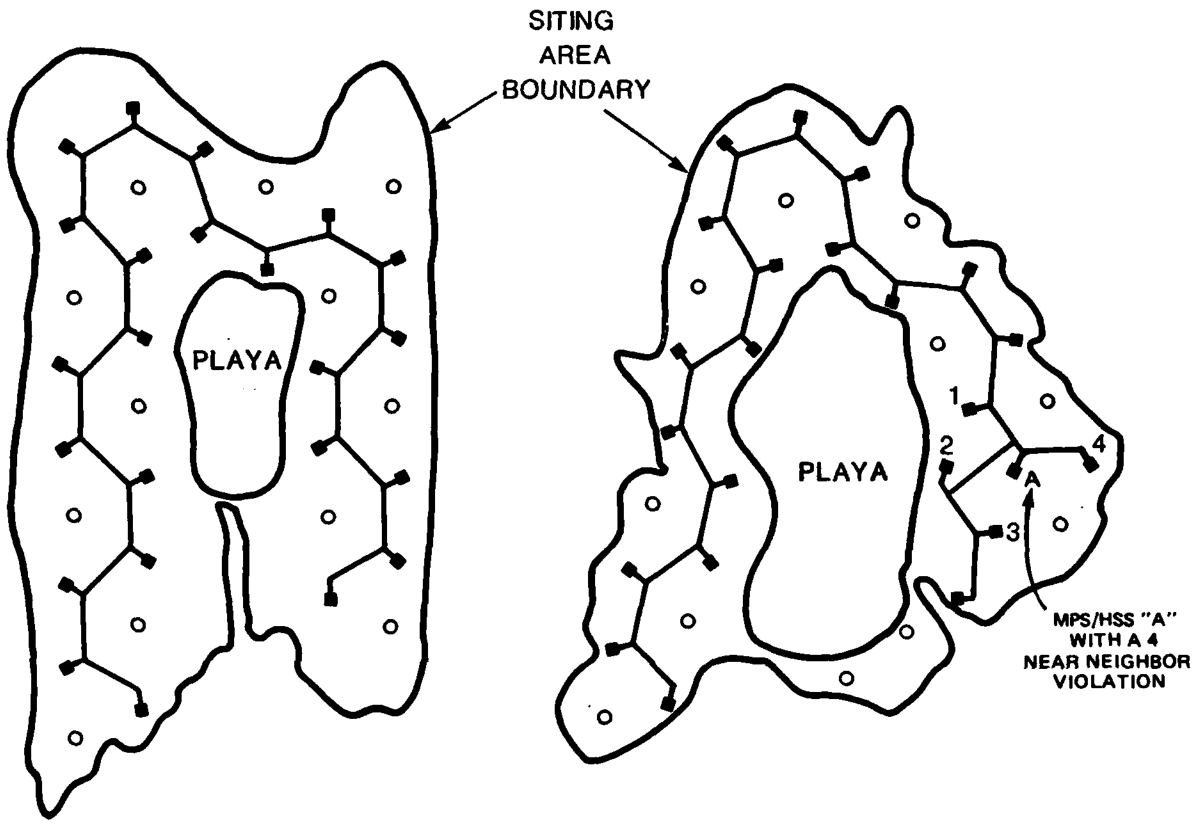
FIGURE 3-7



REGULAR HEXAGON PATTERN

- CONTINUOUS REGULAR HEX USING ALL CENTER POINTS AS BACKFILLS
- RESULTING 23/1 CLUSTER REVEALS A REGULAR DIRECT CONNECT CRN

DISTORTED HEXAGON PATTERN

- DISTORTED REGULAR HEX OCCURS WHEN A CENTER POINT (2) IS USED AS A SHELTER DUE TO SITING EXCLUSIONS
- RESULTING 23/1 CLUSTER REVEALS A BRANCH DIRECT CONNECT CRN
- HSS "A" HAS A FOUR NEAR NEIGHBOR VIOLATION (1, 2, 3, 4)

NOTES:
■ SHELTER
○ BACKFILL

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EXAMPLE OF SITING REQUIREMENT VIOLATION DUE TO DISTORTION OF HEXAGONAL GRID

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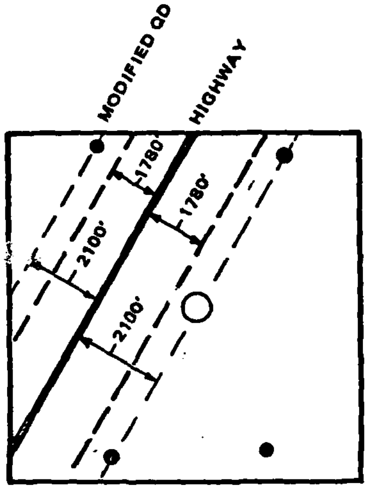
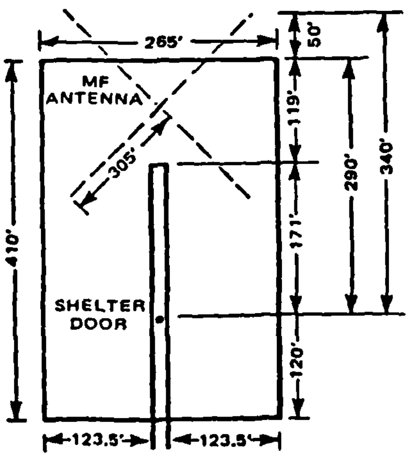
FIGURE 3-8



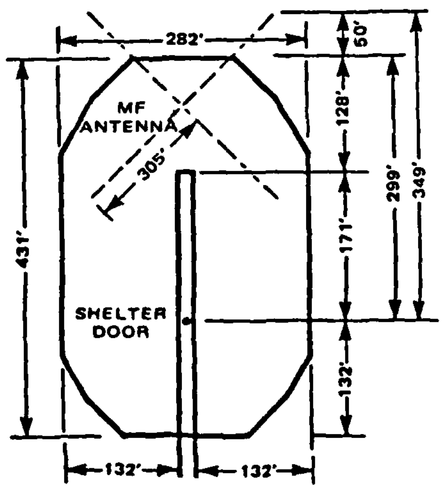
1:62,500

ALIGNMENT OF HEXAGONAL GRID TO MODIFIED QD

THE USE OF THE MODIFIED QD PERMITS THE HEXAGONAL GRID TO BE ALIGNED SO AS TO ACCOUNT FOR HSS DIMENSIONS. THE GRID POINTS REPRESENT THE SHELTER DOOR WHILE THE QDS RELATE TO ANY PORTION OF THE PERIMETER FENCE OR ACTUAL SHELTER STRUCTURE.



RECTANGULAR HSS



DODECAGON HSS

NOTES:

1. THE RECTANGULAR HSS WAS SUPERCEDED BY THE DODECAGON HSS 2 FEB. 1981
2. FACILITIES ARE ONLY SCHEMATIC REPRESENTATIONS AND ARE NOT TO SCALE
3. THE PERIMETER OF THE HSS IS THE FENCE LINE WHICH ENCOMPASSES AN AREA OF 2.5 ACRES

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RATIONALE FOR MODIFIED QD REQUIREMENTS

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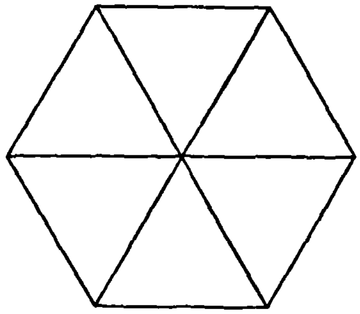
November 80 Siting Document QD Requirements

Power lines	
50 kV or less	750 feet
50 kV - 250 kV	1250 feet
250 kV or more	2500 feet
Highway	
ADT > 50	1780 feet
Inhabited Bldgs	2[illegible]65 feet

SPACING REFERENCE TEMPLATE WITH MODIFIED QDS 1:62.500 MPS LAYOUTS

A	1100 feet QD power line 50 kV or less
	1600 feet QD power line 50 – 250 kV
	2850 feet QD power line 250 kV or more
B	2100 feet QD highway
C	3300 feet QD inhabited Bldg
D	0.5 statue mile standoff (RSS to HSS)
E	1000 feet HSS rear clearance zone
F	5000 feet min. HSS spacing
	5200 feet HSS spacing
G	1100 feet HSS spur
H	1220 feet CMF spur



The hexagonal cell is used to check MPS orientation, near neighbors, and MPS spacing.

A. Power line QDs include an additional 350 feet of horizontal distance. When measuring these QDs , the end points of reference are the MPS door point and the center line of the power line.

B. Highway QD includes an additional 350 feet of horizontal distance. When measuring this QD , the end points of reference are the MPS door point and the center line of the highway.

C. Inhabited building QD includes an additional 350 feet of horizontal distance. When measuring this QD , the end points of reference are the MPS door point and the nearest point of the inhabited structure.

D. RSS standoff to HSS/MPS is 1/2 statute mile. Measure from MPS door point.

E. HSS rear clearance zone. Measure from MPS door point to rear of HSS in situations where the HSS borders on a wilderness area or phenomenon such as existing roads with ADT less than 50, etc.

F. HSS spacing at 1:62,500 mapping scale, all MPS door points should be 5200 feet apart for both primary locations and "backfills"

G. HSS spur roads are a minimum of 1100 feet to the trunk road

H. CMF spur roads are a minimum of 1220 feet to the trunk road

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SPACING REFERENCE TEMPLATE
1: 62,500 SCALE WITH MODIFIED QDs

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FIGURE 3-10

linear. Overall cost considerations (i.e., length of road) tended to drive the decisions on CRN configuration. The operational aspects of the CRN regarding preservation of location uncertainty and transporter operation (shuffle and dash) did not emerge as major siting considerations.

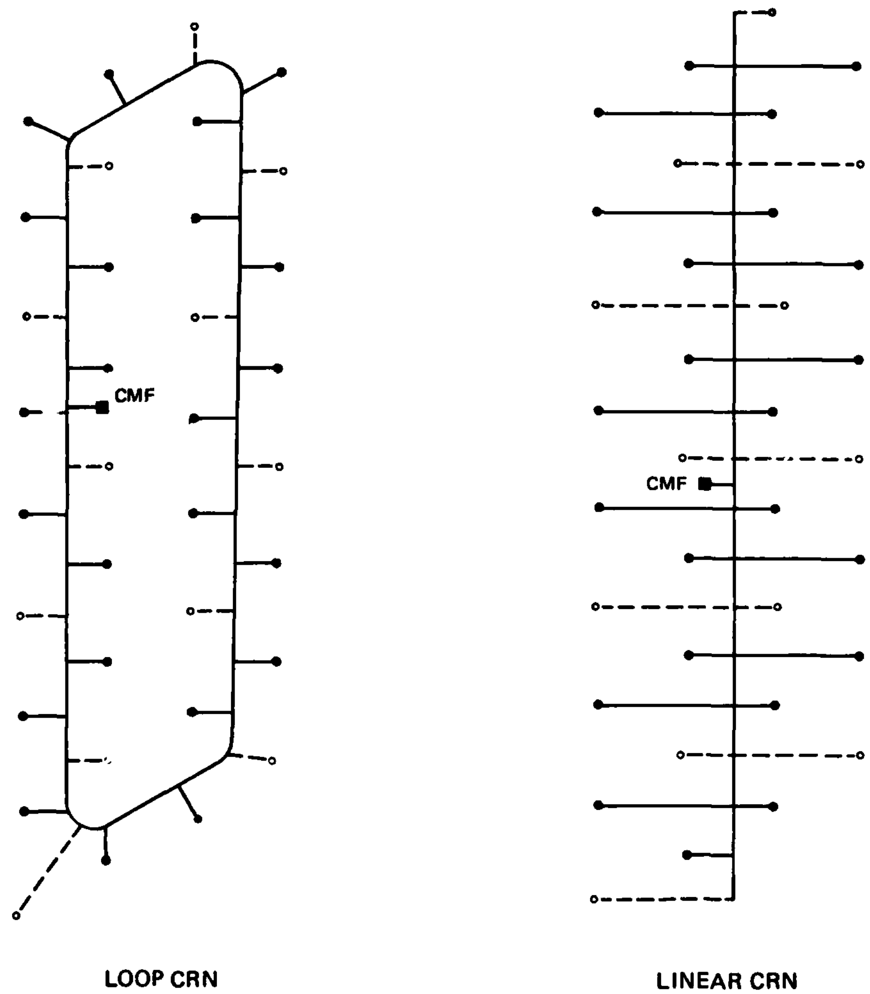
3.2.4.1 Loop CRN Cluster Configurations

Using the loop CRN configuration, four shelter spacing variations were examined, 7000-, 6300-, 6000- and 5000-foot (2134-, 1920-, 1829-, and 1524-m) spacing. These layouts were compiled at 1:62,500 scale, using Dry Lake, Nevada, as a sample valley. The 7000-foot (2134-m) spacing layout was selected for transfer to 1:9600 and 1:4800 scale detailed maps. This exercise resulted in the decision to use 1:9600 scale maps for detailed valley layouts (Fugro National, Inc., 1980a).

Another loop CRN configuration studied in March 1980 was the Cooper-Port backfill concept which was characterized by:

- o Minimum spacing between shelters of 5000 feet (1524 m);
- o Preferred average spacing of 5250 feet (1600 m);
- o Preferred average number of shelters per cluster-46;
- o Maximum number of shelters per cluster-50; and
- o Use best 23 sites for primary shelter locations.

A new baseline loop CRN configuration was established on 23 April 1980 which called for 5200-foot (1600-m) spacing, 2/3-filled hexagonal, one CMF and one barrier per cluster (Figure 3-11).



23/1 CLUSTERING
5200 FOOT SPACING
2/3-FILLED HEXAGONAL PATTERN

● SHELTER
○ BACKFILL
– – – POTENTIAL SPUR ROAD TO BACKFILL

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EXAMPLES OF BASIC LOOP AND LINEAR CRN CONFIGURATIONS

30 NOV 81 FIGURE 3-11

The loop CRN configuration was superceded on 12 May 1980 by the linear CRN configuration. The change was initiated due to the following concerns:

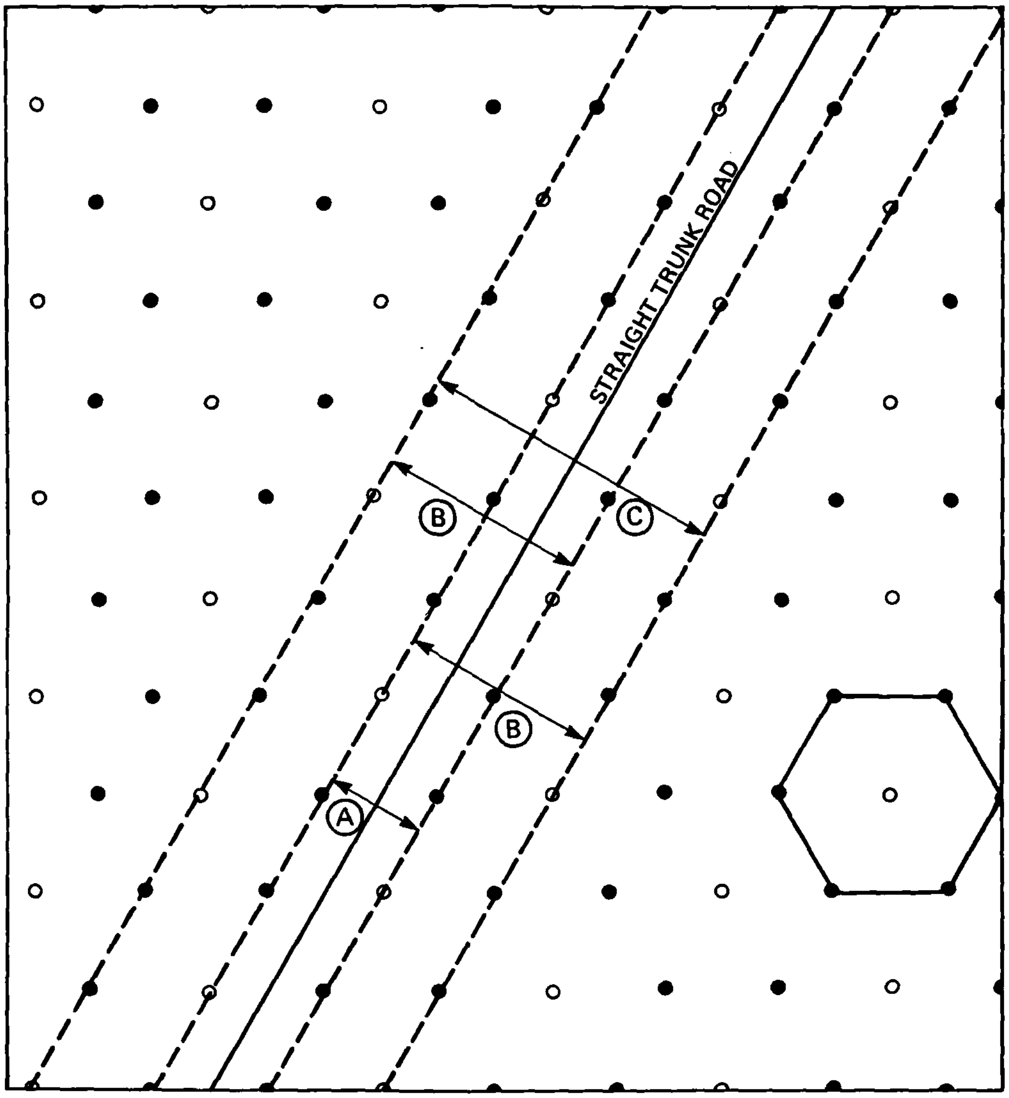
- o Greater total road length of a closed loop CRN as opposed to a linear CRN; and
- o A closed loop CRN could not be sited in narrow elongated areas.

3.2.4.2 Linear CRN Cluster Configurations

The implementation of the linear CRN configuration (May 1980) was followed by the issuing of a BMO/AFRCE-MX siting document on 6 June 1980. In applying the linear CRN configuration requirements to the layouts, a fundamental problem devising an efficient method of connecting the shelters to the trunk road developed. Two linear CRN concepts evolved over several months, the straight trunk and the direct connect concepts.

Figure 3-12 demonstrates the choices of selecting a straight trunk road alignment using a hexagonal grid. The trunk road is positioned on the centerline between the two rows of points. The potential shelter locations which can be attached to this trunk road can be referenced by the number of rows of points used; two rows, three rows, four rows, etc. The single row layout was discarded as inefficient when compared to the two-row layout. The basic straight trunk linear CRN counterpart of the closed loop CRN is the four-row linear CRN shown in Figure 3-11.

The implementation of vulnerability and hardness requirements of relative orientation in July 1980 gave rise to a number of



A TWO ROWS OF POTENTIAL SHELTER SITES
B THREE ROWS OF POTENTIAL SHELTER SITES
C FOUR ROWS OF POTENTIAL SHELTER SITES

● SHELTER
○ BACKFILL

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STRAIGHT TRUNK ALIGNMENT
USING A HEXAGONAL GRID

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FIGURE 3-12

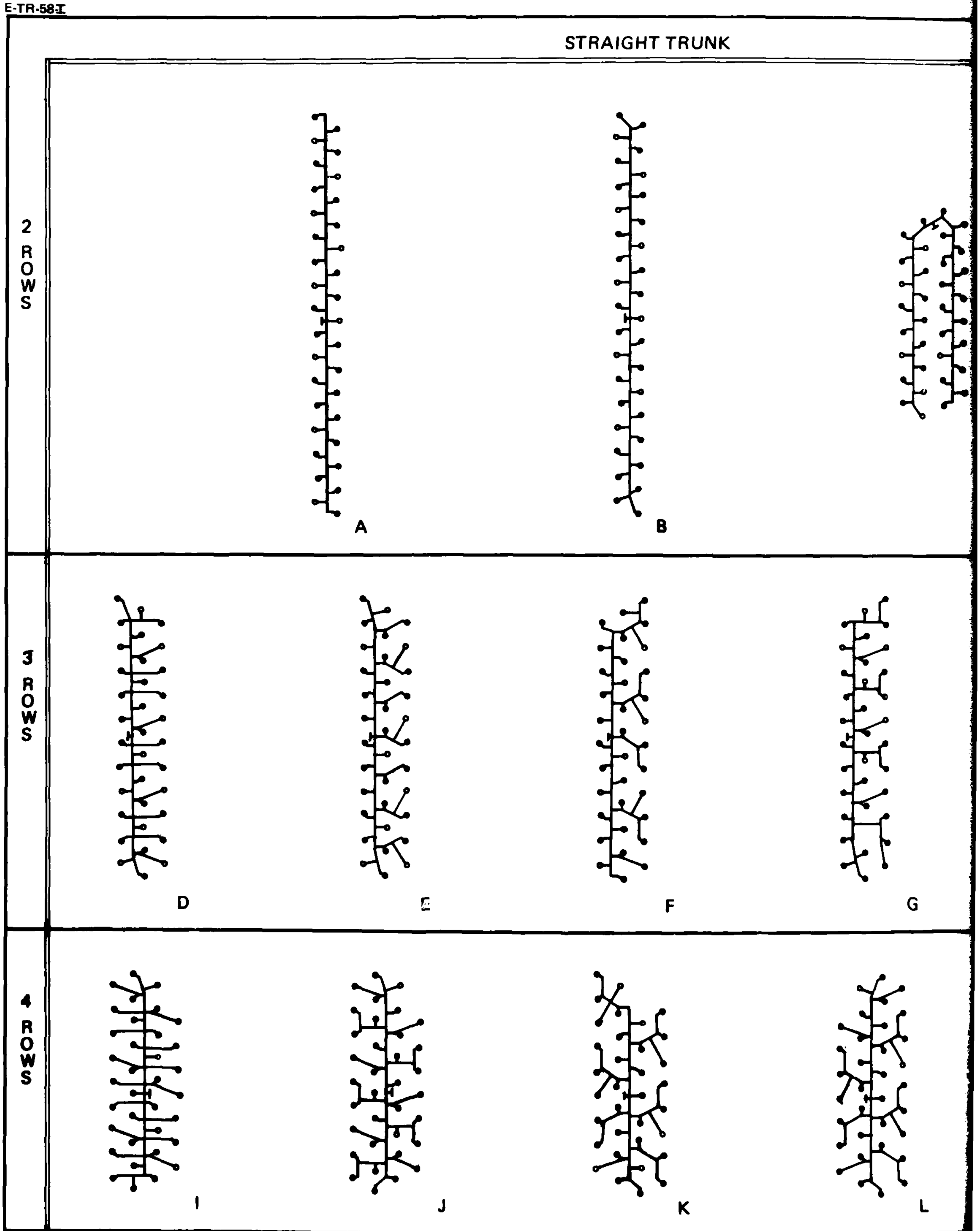
straight trunk variations (Figure 3-13). The classes of straight trunk CRNs presented are two-, three-, and four-row configurations. Each of these classes can be further subdivided by the road connection of the shelters in the third or fourth row.

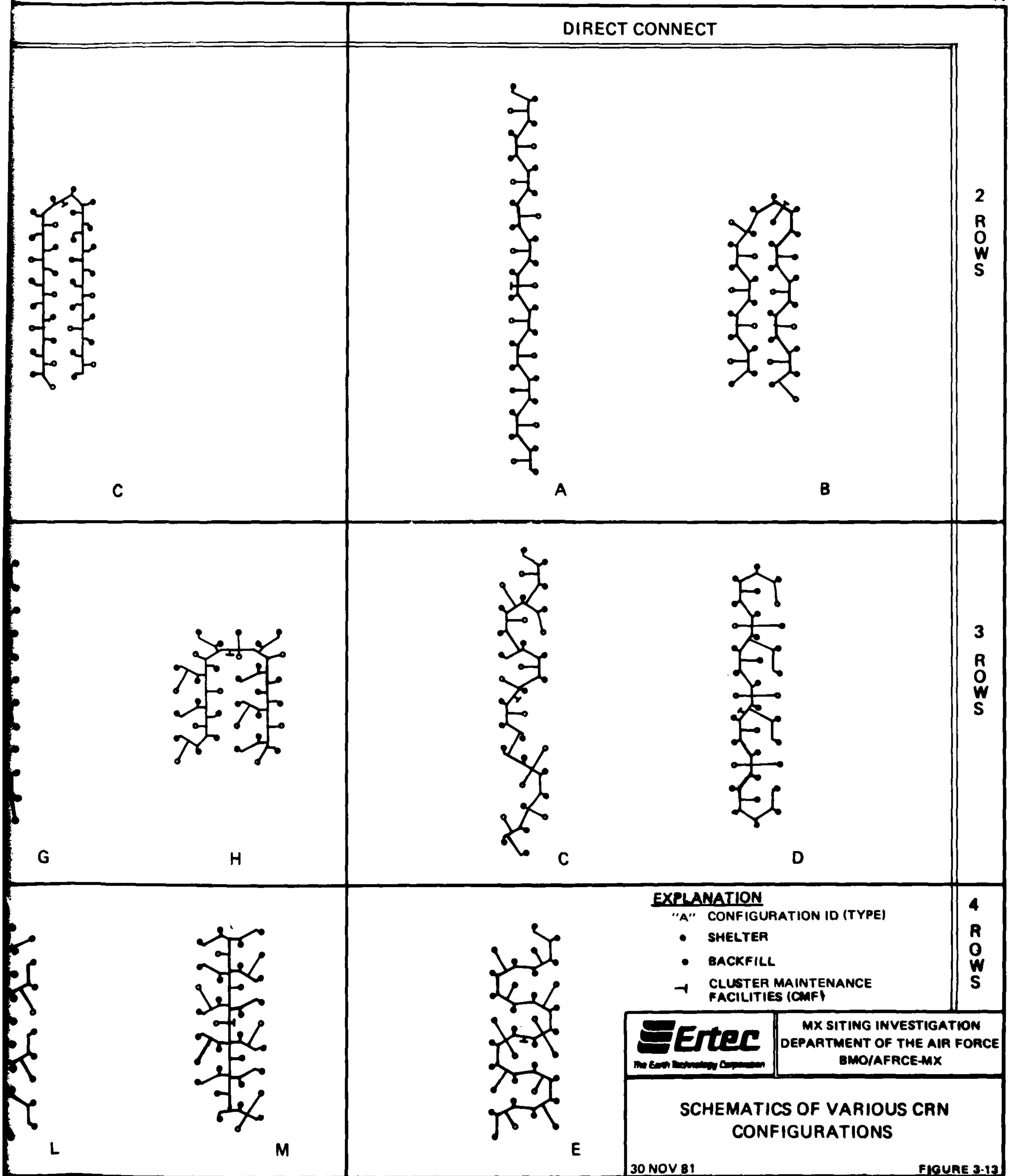
Increasing concern for construction costs resulted in implementation of the direct connect CRN in February 1981. The goal of this concept was to achieve the most direct connection of adjacent shelters in a cluster consistent with minimizing overall system costs. Figure 3-13 illustrates direct connect CRN configurations, and Table 3-6 summarizes the respective CRN lengths. A set of guidelines for the direct connect CRN was established and distributed to layout compilers (Figure 3-14).

3.2.5 Clustering Concepts

The clustering concept was predicated on conformance to SALT II in terms of the number of weapons being verifiable yet survivable. The sheltered road-mobile basing concept involved shuttling the missiles among a set number of shelters. The number of missiles and shelters were in response to the perceived threat and resulting probability of survival of the system.

The initial MPS/HSS basing mode specified 23 shelters per cluster (23/1) with 11 or 12 "backfill" sites (i.e., potential sites for expanison to accommodate increased threats). Each cluster would also have a CMF for routine maintenance of the missile and the TEL.


STRAIGHT TRUNK
2 ROWS
A
B
3 ROWS
D
E
F
G
4 ROWS
I
J
K
L



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SCHEMATICS OF VARIOUS CRN CONFIGURATIONS

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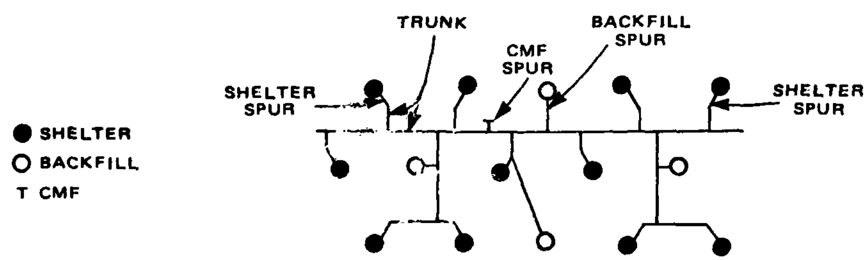
FIGURE 3-13

Type	No. of Rows	Configuration ID	Number of Shelters	Number of Backfills	Trunk	[illegible] Spur	[illegible] Spur	Backfill Spur	TOTAL CRN w/backfill	TOTAL CRN [illegible]
					Road Length (in Statute Miles)					
Straight Trunk	2	A	[illegible]	11	23.[illegible]	[illegible]	0.19	4.40	32.35	[illegible]
		B	23	11	22.65	[illegible]	0.19	4.50	31.70	[illegible]
		C	23	11	22.70	4.36	0.19	4.70	31.95	[illegible]
	3	D	23	12	22.95	4.36	0.19	6.45	33.95	[illegible]
		E	23	12	21.40	4.36	0.19	7.50	33.45	[illegible]
		F	23	12	21.05	4.36	0.19	7.45	33.05	[illegible]
		G	23	12	21.65	4.36	0.19	6.70	3[illegible].90	[illegible]
		H	23	11	[illegible].30	4.36	0.19	6.55	33.40	[illegible]
	4	I	23	12	[illegible].45	4.36	0.19	8.75	35.75	[illegible]
		J	23	12	21.15	4.36	0.19	7.20	32.90	[illegible]
		K	23	11	21.60	4.36	0.19	7.75	33.30	[illegible]
		L	23	12	20.70	4.36	0.19	8.80	34.05	[illegible]
		M	23	11	21.55	4.36	0.19	7.65	33.75	[illegible]
Direct Connect	2	A	23	11	[illegible]	4.36	0.19	7.15	[illegible].75	[illegible]
		B	23	11	18.40	4.36	0.19	7.50	30.45	22.[illegible]
	3	C	23	11	19.05	4.36	0.19	7.45	31.05	23.[illegible]
		D	23	11	19.00	4.36	0.19	8.45	32.00	23.5[illegible]
	4	E	23	12	17.85	4.36	0.19	9.85	3[illegible].25	22.40

Notes:
1. These road lengths are approximate and were hand scaled from 1:62,500 schematics.
2. Shelter and CMF spurs were assumed to be a uniform length of 0.19 miles each. These estimates do not account for radii of curvature.



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SUMMARY OF CRN LENGTHS

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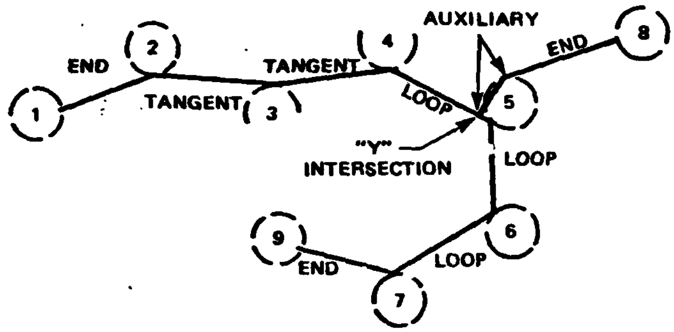
TABLE 3-6



There are three types of main connectors: ends, loops, and tangents.

One type of auxiliary connector.

- Ends (see 1-2, 5-8, 7-9) are "average" lengths
- Loops are shortest possible lengths
- Tangents are the longest lengths of the three types

Auxiliary connectors do not connect points but are used to get around points only at "Y" intersections

- If the horizontal distance between any two points, "a", is 5400 feet and the radius of small dotted circles is 1080 feet (so $R = \frac{a}{5}$), then

  End = (0.717) "a" feet
  Loop = (0.654) "a" feet
  Tangent = (0.872) "a" feet
  Auxiliary = (0.332) "a" feet

- For 23 points, there should always be a fixed number totaling loops, ends, and tangents.
  Let n_T, n_L, n_E, be
  n_T = number of tangents in one cluster
  n_L = number of loops in one cluster
  n_E = number of ends in one cluster
  Total = 22

If there are more than 22, most likely one tangent (or loop) is redundant. If n_y = auxiliaries, they are occurring at random.

- For any cluster, the theoretical shortest distance is:

$$D_{min} = [0.717\ n_E + 0.654\ n_L + 0.872\ n_T + 0.332\ n_y]\ \frac{5400}{5280}$$

- The optimized cluster is the one with as many "loop" sections as possible.

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GUIDELINES FOR OPTIMIZED DIRECT CONNECT CRN LINKS

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FIGURE 3-14

As the likelihood of Senate approval of SALT II diminished, Ertec was directed to conduct preliminary investigations for implementing "valley" clustering. Valley clustering essentially combines all potential shelter sites within a valley into a large cluster. Operational details of valley clustering were evolving, but it was thought that one CMF might serve a single valley. This would result in substantial system cost reduction by eliminating a number of CMFs, barriers, and entry roads.

3.2.6 Documentation

An important step in the siting process was to generate a DOPAA for each valley. These documents serve as input into the assessment of the environmental impacts and supports the tiering process. This documentation is a necessary function in demonstrating compliance to National Environmental Policy Act (NEPA) which requires that environmental factors be considered along with engineering and economic factors in project planning.

3.2.6.1 General Overview

The compilation of conceptual layouts relative to exclusionary factors is straightforward. When violations could not be accommodated by revising the layout, the violations were recorded on a check list. This check list (Appendix E) focuses on the geotechnical exclusions/considerations. Environmental consideration factors were not as readily identifiable or available on the map overlays. Also, the Air Force mitigation management policies were being developed as the problems were identified.

The consideration factors were a potential source of conflict in applying the siting requirements. The majority of consideration factors were environmental and ranged from large scale, vague phenomena (e.g., antelope range and eagle wintering areas) to small scale, discrete locations, essentially areal phenomena to the point phenomena. Certain unavoidable conflicts would arise merely by siting facilities where no facilities had previously existed. The field programs involving site-specific surveys within the valleys were geared to accommodate the consideration factors. This was necessitated in part by the scarcity of large-scale environmental data in map overlay form and by the overall siting methodology which employs conceptual layouts that require field work (i.e., specific sampling) as a check on the general model.

The results of the site-specific field activities serve as valuable input in determining direct and indirect impacts as well as identifying specific mutually exclusive considerations. This information can be used to refine the siting methodology, help establish a mitigation plan, and comply to NEPA requirements. Details of the level of effort in these site-specific field studies can be found in Ertec report E-TR-48, Volume I, II, and III.

3.2.6.2 Computer Applications

Specific documentation was produced on the geometry of the conceptual layouts via computer programs. Completed layouts were digitized using a Talos 800 digitizer tablet to compile digital files of the "x, y" locations of the door points and the azimuth of the shelter orientation (i.e., looking out from the shelter door). A computer program was developed which calculated the relative spacing (from door to door) and the relative angle of neighboring shelters as a conformance check to the siting requirements. Table 3-7 is a sample output of this check program.

Following the successful completion of the geometry checks, the shelter locations were tabulated and referenced to the appropriate state plane coordinate system. The computer output samples in Tables 3-8 and 3-9 are the shelter layout location record and the shelter layout output for cadastral surveying, respectively. Two report forms are necessary to serve separate functions. The layout team needed to record the relative orientation from shelter door to shelter door (i.e., looking from one HSS to another), while common cadastral survey practice is to look toward or into the property boundary being surveyed. Due to the anticipated volume of data, it was arbitrarily decided to use azimuth references for the layout report and bearing references for the survey report to eliminate potential confusion between the two reports. All orientations were reported relative to state plane grid north.

3.3 FIELD SITING SURVEYS

An integral part of the siting program involves field surveys. The field surveys supplement the office work by:

- o Providing an actual field test of some of the elements which make up the suitable area boundaries determined from the Verification program;

A SUBJECT: SHELTER
SPECIFICATION VIOLATION: DISTANCE B
B MIN 5200 FT
SPECIFICATION VIOLATION: ANGLE C
C MIN 60 DEGREE

ID 1	"	ID 2	"	DISTANCE	"	ANGLE 1 to 2	"	ANGLE 2 to 1
1- 2	"	1- 1	"	5236.42	"	59.92	"	59.28
1- 3	"	1- 1	"	5167.31	"	58.89	"	60.91
1- 4	"	1- 3	"	5195.87	"	63.14	"	55.86
1- 7	"	1- 6	"	5201.49	"	75.23	"	59.37
1- 8	"	1- 7	"	5221.08	"	179.07	"	46.03
1-10	"	1- 8	"	5173.31	"	57.65	"	62.95
3- 5	"	1- 9	"	5209.68	"	58.92	"	110.81
1-13	"	1-11	"	5135.02	"	58.07	"	59.83
1-15	"	1-13	"	5302.81	"	59.71	"	61.11
1-15	"	1-14	"	5153.41	"	179.12	"	59.22
1-16	"	1-15	"	5172.61	"	59.09	"	60.71
1-18	"	1-17	"	5212.18	"	59.82	"	59.92
1-19	"	1-18	"	5267.49	"	59.36	"	61.74
1-21	"	1-20	"	5203.54	"	59.01	"	58.51
1-22	"	1-20	"	5120.35	"	58.22	"	176.63
3-11	"	1-22	"	5106.89	"	67.67	"	59.73

A Subject refers to the type of structure/facility

B Distance is to be checked at a constant of 5200 feet, however this constant can be changed as specified in the siting requirements

C Angle is to be checked at a constant of 60 degrees, however this constant can vary as specified in the siting requirements

D Cluster number

E Shelter number

F The distance between the first shelter and second shelter

G The angle from the first shelter to the second shelter

H The angle from the second shelter to the first shelter

NOTE: All computer reports are preceded by documentation of state name, valley name, and State Plane Coordinate Zone

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SAMPLE VALLEY CHECKLIST
PRINTOUT

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TABLE 3-7

CLUSTER 1 ← (A)

SHELTER ← (B)

(C) ID CL SH	"	(D) DOOR X COORDINATE	Y	"	(E) FRONT MONUMENT X COORDINATE	Y	"	(F) AZIMUTH (DEG)
1- 1	"	704575.9	1044887.6	"	704623.0	1044998.0	"	23.10
1- 2	"	701484.7	1049114.2	"	701604.0	1049127.0	"	83.90
1- 3	"	709715.0	1045427.0	"	709642.6	1045522.7	"	322.89
1- 4	"	711385.8	1050346.9	"	711267.0	1050330.0	"	261.90
1- 5	"	705848.2	1053434.5	"	705943.0	1053508.0	"	52.20
1- 6	"	716424.7	1051280.3	"	716351.0	1051375.0	"	322.10
1- 7	"	718328.2	1056121.0	"	718209.0	1056135.0	"	276.70
1- 8	"	715166.2	1060275.7	"	715092.0	1060370.0	"	321.80
1- 9	"	708932.0	1068717.0	"	709000.6	1068618.6	"	145.10
1-10	"	717331.9	1064973.9	"	717213.0	1064958.0	"	262.40
1-11	"	714102.0	1069221.8	"	714221.0	1069237.0	"	82.70
1-12	"	722450.0	1065670.0	"	722378.1	1065766.1	"	323.20
1-13	"	716097.8	1073953.0	"	716167.0	1073855.0	"	144.80
1-14	"	724504.2	1070446.0	"	724385.0	1070432.0	"	263.30
1-15	"	721368.5	1074535.7	"	721297.0	1074632.0	"	323.40
1-16	"	723481.1	1079257.2	"	723362.0	1079243.0	"	263.20
1-17	"	720401.0	1083420.0	"	720358.9	1083311.4	"	205.20
1-18	"	715216.7	1082976.5	"	715268.0	1083085.0	"	25.30
1-19	"	712087.6	1087213.9	"	712207.0	1087226.0	"	84.20
1-20	"	714219.0	1091976.0	"	714292.7	1091881.3	"	142.10
1-21	"	719390.0	1092557.0	"	719317.1	1092652.3	"	322.60
1-22	"	710841.0	1095824.0	"	710959.4	1095843.8	"	80.50
1-23	"	718205.0	1101543.0	"	718162.0	1101431.0	"	201.00

(A) Cluster Number

(B) Structure/facility type

(C) ID: Cluster and shelter number

(D) Door coordinate, State Plane Coordinate System, X-Easting, Y-Northing

(E) Location of front monument in State Plane Coordinate System X-Easting, Y-Northing

(F) Azumith in decimal degrees referred to State Plane Grid North looking from the shelter door toward the access ramp

NOTE: All computer reports are preceded by documentation of state name, valley name, and State Plane Coordinate Zone

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SAMPLE OF LAYOUT LOCATION RECORD

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CLUSTER 1 ← A

SHELTER ← B

TYPE	ID (C) CL SH	FRONT MONUMENT (D) N COORDINATE	E	BEARING (E) (DEG)	(DEG MIN)
SHELTER	1- 1	1044998	704623	S 23.10 W	S 23D 6M W
SHELTER	1- 2	1049127	701604	S 83.90 W	S 83D 54M W
SHELTER	1- 3	1045523	709643	S 37.11 E	S 37D 6M E
SHELTER	1- 4	1050330	711267	N 81.90 E	N 81D 54M E
SHELTER	1- 5	1053508	705943	S 52.20 W	S 52D 12M W
SHELTER	1- 6	1051375	716351	S 37.90 E	S 37D 54M E
SHELTER	1- 7	1056135	718209	S 83.30 E	S 83D 18M E
SHELTER	1- 8	1060370	715092	S 38.20 E	S 38D 12M E
SHELTER	1- 9	1068619	709001	N 34.90 W	N 34D 54M W
SHELTER	1-10	1064958	717213	N 82.40 E	N 82D 24M E
SHELTER	1-11	1069237	714221	S 82.70 W	S 82D 42M W
SHELTER	1-12	1065766	722378	S 36.80 E	S 36D 48M E
SHELTER	1-13	1073855	716167	N 35.20 W	N 35D 12M W
SHELTER	1-14	1070432	724385	N 83.30 E	N 83D 18M E
SHELTER	1-15	1074632	721297	S 36.60 E	S 36D 36M E
SHELTER	1-16	1079243	723362	N 83.20 E	N 83D 12M E
SHELTER	1-17	1083311	720359	N 25.20 E	N 25D 12M E
SHELTER	1-18	1083085	715268	S 25.30 W	S 25D 18M W
SHELTER	1-19	1087226	712207	S 84.20 W	S 84D 12M W
SHELTER	1-20	1091881	714293	N 37.90 W	N 37D 54M W
SHELTER	1-21	1092652	719317	S 37.40 E	S 37D 24M E
SHELTER	1-22	1095844	710959	S 80.50 W	S 80D 30M W
SHELTER	1-23	1101431	718162	N 21.00 E	N 21D 0M E

A Cluster Number

B Structure/facility type

C ID Cluster and shelter number

D Location of Front Monument in State Plane Coordinate System Northing and Easting

E Bearing of shelter Front Monument (in decimal degrees and degrees and minutes), referenced to State Plane Grid North looking into the HSS

NOTE: All computer reports are preceded by documentation of state name, valley name, and State Plane Coordinate Zone

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SAMPLE OF CADASTRAL PRINT OUT

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TABLE 3-9

- o Providing site-specific environmental data to augment the limited amount of mapped environmental data;
- o Providing a real world test of the basic map overlays compilation procedure in developing the conceptual layouts;
- o Identifying unmapped features and updating the siting maps; and
- o Refining conceptual layout by field correction of siting problems.

The previous siting studies involved large areas (e.g., regions, valleys). The field siting surveys are site specific to the MX cluster facilities within a valley. Thus, cadastral survey coordinates are required. Given the cadastral locations of the sites, field crews conduct detailed studies to assess the suitability of the sites relative to the specified siting requirements.

3.3.1 Geotechnical Assessment

During the cadastral surveying of the facility sites, field geologists visited the sites to assure that each site met the siting requirements and to observe the local topography. Of particular concern to the siting team was the occurrence of drainage features which were not shown on the siting base maps because of scale limitations. Depth to rock and water could be determined; however, reasonable judgments could be made based on the site conditions, location of outcrops, etc. If shallow rock or water was suspected, it was noted on the inspection form so that subsurface conditions could be checked in future investigations.

3.3.2 Geographical Assessment

Primary concerns were updating the base maps in terms of the unmapped features which could influence siting (e.g., roads, inhabited structure, fence lines, etc.). Also land ownership/use needed to be verified and updated.

3.3.3 Environmental Studies

The environmental studies consisted of biological and cultural resources surveys. Data for environmental phenomena influencing siting were generally found to be limited.

In addition, these data were usually in map form which was not compatible with the map overlay process being used to compile the conceptual layouts. Also, the phenomena may be vaguely defined in terms of areal extent. Some were very discrete, occurring at local sites, but not visible at the 1:62,500 map scale or the phenomena occurred in large, well-defined areas, but was not available in map form. The field environmental program attempted to remedy these data shortfalls and provided the necessary information to the siting teams in order to refine the conceptual layouts.

Although the siting studies focus on a facility site, the environmental concerns involved both direct and indirect impacts. The ecosystem is a complex interrelationship which required the study of both biological and cultural resources.

3.3.3.1 Biological Surveys

Prior to the field work, the biologists obtained existing information concerning biological resources in the valleys and adjacent area. This allowed them to design an effective survey technique and appropriate field forms and to become aware of unique resources which might be expected within the study area.

List of threatened, endangered, or sensitive plant and wildlife species were obtained from a number of federal, state, and local agencies and groups. A list of species and habitats which the states considered to be critical or sensitive were requested from the Nevada Department of Wildlife and the Utah Department of Natural Resources.

Agency records and the literature were then researched to compile information on the location of known populations of threatened, endangered, or sensitive species; areas where these might be expected; and location of key habitat and wildlife ranges. Sage grouse strutting grounds, raptor nest locations, antelope, mule deer, and other game species, identification of water sources and migration routes, and related concerns are included.

The area to be surveyed at each location was much larger than the area expected to be impacted by the facility, to allow for an evaluation of indirect disturbance to adjacent areas during construction and operation.

Because many wildlife species are active only at night, trapping was conducted to provide additional information on species composition of smaller mammals in the study area. Sherman live traps were set in major vegetation areas, a species inventory compiled, and the animals were released.

3.3.3.2 Cultural Resources Surveys

The survey of cultural resources is required as per the Programmmatic Memorandum of Agreement (PMOA) of the advisory Council of Historic Preservation (Appendix E).

The Cultural Resources investigation is designed to inventory and evaluate cultural resources in the areas to be impacted by the construction of the MX system. The study consisted of five tasks: agency consultations, background literature and records searches, field survey, analysis, and report preparation. The purpose of each of the phases and the methods used to accomplish them are discussed below.

The initial task was to consult with state and federal agencies including the State Historic Preservation Offices and the Bureau of Land Management. Ertec consulted with these agencies to obtain their input on the methodology most appropriate for the survey, to hear their concerns about the cultural resources in the valleys, and to obtain any data they had on those resources.

The second task consisted of collecting and compiling all data available on previously recorded cultural resources sites in the valleys, previous projects that had been carried out in the valleys and the areas involved, and any academic studies dealing with the prehistory, anthropology, or history of those valleys and the general regions in which they are located.

The purpose of this background work was to provide a general knowledge of the area so that Ertec could better interpret the field results and ensure that sites are not re-recorded. These data were compiled and previously recorded sites plotted on maps which were used in the field.

The third task was the field survey. This survey entailed the examination of all shelter locations in the valleys and selected connecting roads and portions of the DTN in the valley. The purpose of these field surveys was to identify sites that would be impacted by construction of the shelters and roads and recommend that significant sites be avoided by resiting of shelters. A list of site types that were considered significant enough to require avoidance was provided by the Bureau of Land Management.

The initial step in the field survey was to locate the survey monuments that were set by the cadastral surveyors. For the facility sites, these monuments consisted of 4-inch (10-cm) diameter survey caps attached to rebars which had been driven in the ground. For the DTN, the monuments consisted of survey stakes at 1/4-mile (.40-km) intervals. The spacing for the connecting roads varied depending on site-specific terrain conditions. The survey sample units and roads were plotted on 1:62,500 and 1:9600 scale topographic maps. These were used as field maps for locating survey units and plotting cultural resources sites.

3.3.3.3 Data Analyses and Reports

Following the biological and cultural resources field surveys all data were returned to the office and the fourth task, data analysis, was conducted. The purpose of the data analysis was to compile all information on the cultural sites discovered and determine what they added to the knowledge of the prehistory and history of the area.

The final phase of the cultural resources survey consisted of report preparation. The purpose of the report would be to present the results of the study to the Air Force and to the community of professional biologists and archaeologists. The report would summarize the methods and results of the background research and field survey and discuss how the sites discovered during the survey contributed to the knowledge of the prehistory and history of those areas. The significance of these sites would be assessed and recommendations made about which sites might be eligible for the National Register of Historic Places. The final sections of the report would consider the adverse effects that the MX project would have on significant archaeological sites and suggest methods for mitigating these effects.

3.3.4 Operational Assessment

Although many details of the operational aspects of the MX system are being refined, the field program provided first-hand observations regarding potential CRN alignment considerations, MPS/HSS orientation and shelter ramp alignments, and security considerations. These data are fedback to the siting teams for consideration in refining the conceptual layouts.

3.4 SYSTEM SITING COORDINATION

The size and complexity of the MX program required close coordination not only between Ertec and the Air Force but also with the many MX contractors. Coordination was conducted via client briefings, technical interchange meetings, and siting reviews.

3.4.1 Client Briefings

The majority of client briefings with the Air Force were held with the BMO and the AFRCE-MX. These meetings were held either as periodic status briefings or at the request of the Air Force to deal with specific issues or program updates. Monthly activity reports were also submitted to the client.

3.4.2 Technical Interchange Meetings

At various times throughout the program, technical interchange meetings were held with the Air Force and other MX contractors. The purpose of these meetings was to exchange technical data among contrators working on related portions of the MX program. At the discretion of the Air Force, working groups of contractors were formed to perform specific tasks. Some of the contractors and the working groups formed are indicated with Table 3-10. Two specific tasks which Ertec was involved with were: 1) the data exchange to the environmental assessment contractor in support of tiering, and 2) the coordination of the siting data generated by the base comprehensive planner (EDAW, Inc.), the U.S. Department of the Army, Corps of

AGENCY/ CONTRACTOR	WORKING GROUPS			
	DTN/ASC	OBTS	OB*	TIERING
BMO	●	●	●	●
AFRCE-MX	●	●	●	●
SAC	●		●	
COE	●	●	●	●
BOEING		●		
EDAW				●
ERTEC	●	●	●	●
HDR	●	●	●	●
MMC	●	●	●	
RMP	●		●	
TRW	●	●	●	●

* PRIOR TO THE EXISTENCE OF THE BASE COMPREHENSIVE PLANNER

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AGENCIES/CONTRACTORS INVOLVED IN MX SITING WORKING GROUPS

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Engineers (COE), and Ertec into an integrated land acquisition application package. This package included the data depicted on the "E" size map series and the land parcel descriptions.

3.4.3 Siting Review

Review of the conceptual layouts occurred in two forms, technical/operational and policy/environmental. The technical/operational reviews were concerned with the conformance to the siting requirements. The primary concern were geometry and geotechnical aspects affecting vulnerability and hardness and potential construction costs. The technical/operational reviews were regarded as in-house reviews. The participants included the Air Force, Ertec, HDR, and TRW. The policy/environmental reviews dealt with general Air Force policy regarding the consideration category topics especially as they related to environmental considerations. This review included not only the representatives above but also state, local, and tribal governments and civic groups. The policy/environmental review phase is discussed in detail in Section 4.3 of this report.

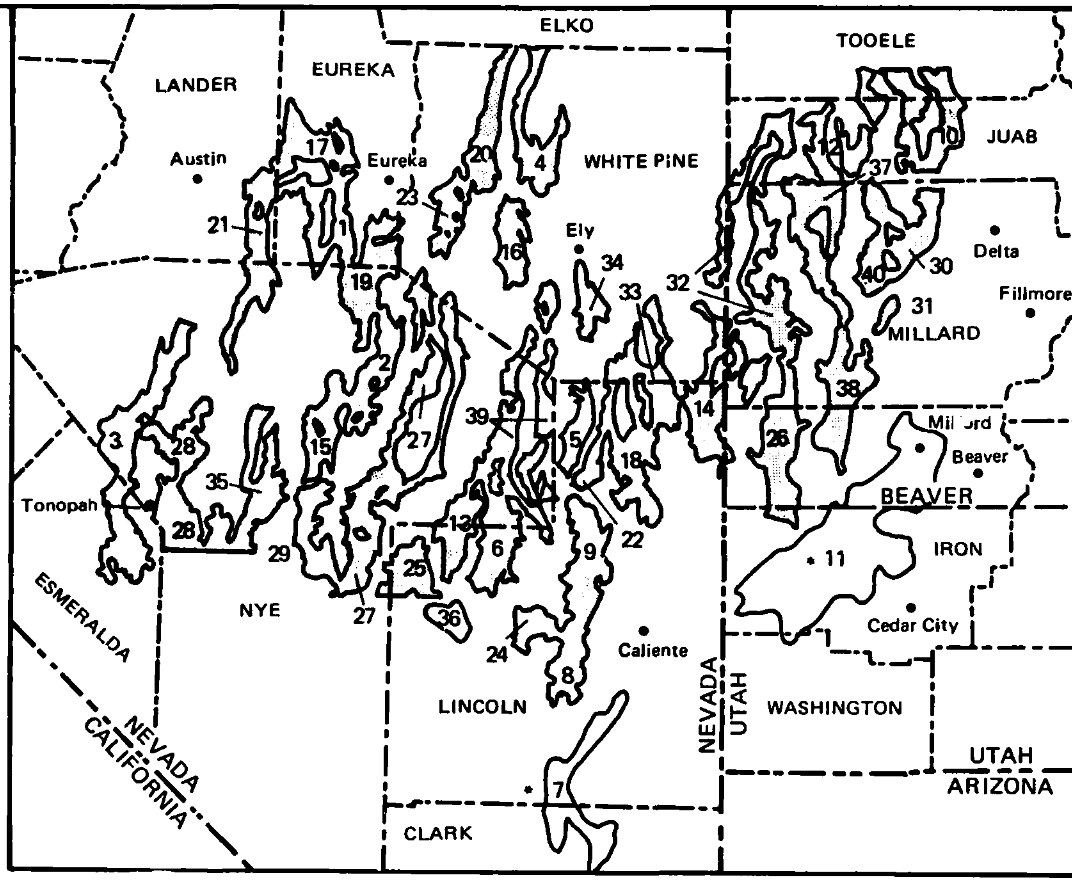
4.0 MPS/HSS SITING PROGRAM, NEVADA/UTAH DDA

The Nevada/Utah DDA extends over 37 valleys in 11 counties involving approximately 10,200 mi^2 (26,400 km^2) (Figure 4-1). Table 4-1 summarizes the geotechnically suitable area estimates at the end of FY 81 listed by valley in each state. The actual suitable area used for MPS/HSS siting is less than the geotechnically suitable area listed when geographical and environmental exclusion factors are applied and all considerations have been evaluated.

The summary tables presented in this section show more than 200 clusters. In discussions with the Air Force, it was decided to maintain a cluster count of 10 to 15 percent greater than the required 200. The reason for the surplus was to provide a buffer for expected losses. Some losses were expected because Verification studies had not been completed and additional reductions in suitable area could be expected. Other losses could be expected as a result of more detailed studies and still other losses could occur because of high construction costs.

In FY 81 the shelter siting effort focused on regional system studies, conceptual MPS/HSS layouts (1:62,500 scale), the BMO/AFRCE-MX siting review of all valleys, field surveys of the IOC valleys, and the preparation of the first increment of the land acquisition application. These studies utilized the methodology and siting requirements described in earlier sections of this report.

A. INDEX MAP SHOWING LOCATION OF THE STUDY AREAS.



B. ENLARGEMENT OF SHADED AREA ON INDEX MAP. SHADED AREAS REPRESENT VALLEYS IN THE DDA.

* Areas not included in DDA

1. ANTELOPE VALLEY
2. BIG SAND SPRINGS VALLEY
3. BIG SMOKY VALLEY
4. BUTTE VALLEY
5. CAVE VALLEY
6. COAL VALLEY
*7. COYOTE SPRING VALLEY
8. DELAMAR VALLEY
9. DRY LAKE VALLEY
10. DUGWAY VALLEY
*11. ESCALANTE DESERT
12. FISH SPRINGS FLAT
13. GARDEN VALLEY
14. HAMLIN VALLEY
15. HOT CREEK VALLEY
16. JAKES VALLEY
17. KOBEH VALLEY
18. LAKE VALLEY
19. LITTLE SMOKY VALLEY
20. LONG VALLEY
21. MONITOR VALLEY
22. MULESHOE VALLEY
23. NEWARK VALLEY
24. PAHROC VALLEY
25. PENOYER (SAND SPRING VALLEY)
26. PINE VALLEY
27. RAILROAD VALLEY
28. RALSTON VALLEY
29. REVEILLE VALLEY
30. SEVIER DESERT
31. SEVIER LAKE
32. SNAKE VALLEY
33. SPRING VALLEY
34. STEPTOE VALLEY
35. STONE CABIN VALLEY
*36. TIKABOO VALLEY
37. TULE VALLEY
38. WAH WAH VALLEY
39. WHITE RIVER VALLEY
40. WHIRLWIND VALLEY

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MX DESIGNATED DEPLOYMENT AREA
NEVADA/UTAH

30 NOV 81

FIGURE 4-1

UTAH		GEOTECHNICALLY SUITABLE AREA (MI 2)	VALLEY INDEX NUMBER (AS PER FIG. 4-1)
DUGWAY	DW	161	10
FISH SPRINGS FLAT	FS	135	12
PINE	PI	278	26
SEVIER DESERT	SD	477	30
SEVIER LAKE	SL	—	31
SNAKE	SV	656	32
TULE	TL	391	37
WAH WAH	WA	234	38
WHIRLWIND	WW	449	40
	UT SUBTOTAL	2781	

NEVADA			
ANTELOPE	AN	125	1
BIG SAND SPRINGS	BG	210	2
BIG SMOKY	BS	693	3
BUTTE	BV	295	4
CAVE	CV	115	5
COAL	CL	240	6
DELAMAR	DM	154	8
DRY LAKE	DL	310	9
GARDEN	GN	200	13
HAMLIN	HV	335	14
HOT CREEK	HC	252	15
JAKES	JV	157	16
KOBEH	KB	211	17
LAKE	LV	267	18
LITTLE SMOKY	LS	254	19
LONG	LG	230	20
MONITOR	MV	280	21
MULESHOE	MS	76	22
NEWARK	NK	150 •	23
PAHROC	PA	103	24
PENOYER	PN	265	25
RAILROAD	RR	748	27
RALSTON	RV	375	28
REVEILLE	RE	145	29
SPRING	SP	250	33
STEPTOE	SO	90	34
STONE CABIN	ST	397	35
WHITE RIVER	WR	485	39
	NV SUBTOTAL	7412	
	TOTAL	10,193	

• BASED ON RECONNAISSANCE VERIFICATION MAPPING

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GEOTECHNICALLY SUITABLE AREA FOR MPS/HSS BASING MODE

30 NOV 81 TABLE 4-1

4.1 REGIONAL SYSTEM STUDIES

Regional system studies were conducted in order to gain an overview of the extent and spatial relationships of the MX facilities. The regional studies initially were performed using 1:500,000 scale maps. As the 1:62,500 scale conceptual layouts became available, they were graphically transferred to the regional map.

4.1.1 Layouts at 23 Shelters per Cluster (23/1)

Early in FY 80, it was estimated that eight valleys in Utah and 16 valleys in Nevada would be adequate for deploying a 200-cluster MX missile system. The Verification program was planned so that the field studies in the 24 valleys would be completed by the end of FY 80. However, as layout studies progressed during the year, it became apparent that a larger area would be needed. A review was made of additional suitable area that had been identified during the screening studies. From this review, it was concluded that the best direction to expand the deployment area was to the north and west in Nevada. Twelve additional valleys were identified: Jakes, Newark, Butte, Long, Kobeh, and Monitor in the north and Big Sand Springs, Little Smoky, Antelope, Ralston, and Big Smoky to the west. Steptoe was added as a potential valley in case it was not selected as an OB site.

The FY 81 geotechnical Verification program included studies in these valleys. The plan consisted of performing reconnaissance studies in the first quarter of FY 81 to improve suitable area boundaries and completing the field studies in the last half of FY 81.

A number of regional maps were prepared in FY 80 and FY 81 to exhibit the progress of the layout studies at different periods of time. A brief description of several of these layouts follows. Table 4-2 summarizes the cluster counts. Unless otherwise indicated, the studies employed 23/1 clustering, 5200-foot (1585-m) spacing, and 2/3-filled hexagonal pattern.

- 22 May 1980 - Compilation of the cluster layouts at 1:500,000 scale based on geotechnically suitable area boundaries, cultural exclusions from COE-Real Estate Planning Report March 1980, and loop CRN clustering.

- 27 June 1980 - Preliminary 1:62,500 cluster layouts were compiled for all valleys. Verification studies had been completed for a few valleys. A preliminary DTN was identified to connect the linear CRN cluster.

- 1 July 1980 - Candidate Operational Base (OB) sites were added. A cluster was removed from Whirlwind Valley (Delta OB site) and added to Stone Cabin Valley.

- 17 July 1980 - Based on AFRCE-MX input, 13 clusters in Big Smoky and nine clusters in Ralston Valley were removed and new clusters were added to Jakes (2), Long (3), Butte (4), Kobeh (6), northern Monitor (1), Lake (1), and Spring (3), Nevada, and Pine (1) and Sevier Desert (1), Utah.

- 2 September 1980 - Based on the 17 July 1980 regional map, exclusion of the proposed Great Basin National Park caused cluster losses in Hamlin (1), and Spring valleys (4), Nevada. These losses were replaced by the addition of five clusters in Ralston Valley and was issued by BMO as MX system baseline.

- 26 September 1980 - The regional map was revised to support the MX Environmental Impact Statement. Clusters were dropped from various valleys and added to northern Ralston (4), Big Smoky (13), southern Monitor (2), Cave (1), and Newark (1), Nevada, and Sevier Lake (1), Utah.

- 15 May 1981 - Delivered to AFRCE-MX 1:62,500 layouts for 37 valleys in Nevada/Utah DDA with incorporation of direct connect CRN baseline configuration. The regional map depicted the area clustered and not the actual CRN clusters.

		REGIONAL CONCEPTUAL LAYOUTS 1: 500,000												VALLEY CONCEPTUAL LAYOUTS 1: 500,000			
		22 MAY 80		27 JUNE 80		1 JULY 80		17 JULY 80		2 SEPT 80		26 SEPT 80		15 MAY 81		30 NOV 81	
		VALLEY UNDER STUDY	NO. OF CLUSTERS	VALLEY UNDER STUDY	NO. OF CLUSTERS	VALLEY UNDER STUDY	NO. OF CLUSTERS	VALLEY UNDER STUDY	NO. OF CLUSTERS	VALLEY UNDER STUDY	NO. OF CLUSTERS	VALLEY UNDER STUDY	NO. OF CLUSTERS	VALLEY UNDER STUDY	NO. OF CLUSTERS	VALLEY UNDER STUDY	NO. OF CLUSTERS
UTAH																	
DUGWAY	DW	●	0	●	5	●	5	●	8	●	5	●	5	●	5	●	5
FISH SPRINGS FLAT	FS	●	10	●	3	●	3	●	3	●	3	●	2	●	2	●	2
PINE	PI	●	12	●	4	●	4	●	5	●	5	●	5	●	5	●	5
SEVIER DESERT	SD	●	0	●	3	●	3	●	4	●	4	●	4	●	2	●	2
SEVIER LAKE	SL											●	1	●	1	●	1
SNAKE	SV	●	0	●	16	●	16	●	16	●	16	●	16	●	19	●	19
TULE	TL	●	14	●	12	●	12	●	12	●	12	●	9	●	10	●	10
WAH WAH	WA	●	11	●	7	●	7	●	7	●	7	●	7	●	5	●	5
WHIRLWIND	WW	●	17	●	12	●	11	●	11	●	11	●	11	●	12	●	12
UT SUBTOTAL		8	64	8	62	8	58	8	63	8	63	9	60	9	61	9	61
NEVADA																	
ANTELOPE	AN	●	–	●	7	●	7	●	7	●	7	●	7	●	4	●	4
BIG SAND SPRINGS	BG	●	–	●	3	●	3	●	3	●	3	●	3	●	3	●	3
BIG SMOKY	BS	●	–	●	13	●	13					●	13	●	10	●	10
BUTTE	BV							●	4	●	4	●	4	●	9	●	9
CAVE	CV	●	3	●	3	●	3	●	3	●	3	●	2	●	3	●	3
COAL	CL	●	13	●	6	●	6	●	6	●	6	●	6	●	6	●	6
DELAMAR	DM	●	3	●	4	●	4	●	4	●	4	●	4	●	3	●	3
DRY LAKE	DL	●	10	●	10	●	10	●	10	●	10	●	10	●	10	●	10
GARDEN	GN	●	10	●	6	●	6	●	6	●	6	●	6	●	6	●	6
HAMLIN	HV	●	14	●	10	●	10	●	10	●	9	●	0	●	10	●	10
HOT CREEK	HC	●	10	●	5	●	5	●	5	●	5	●	4	●	6	●	6
JAKES	JV							●	2	●	2	●	2	●	3	●	3
KOBEH	KB							●	6	●	6	●	6	●	5	●	5
LAKE	LV	●	13	●	7	●	7	●	8	●	8	●	6	●	7	●	7
LITTLE SMOKY	LS	●	–	●	3	●	3	●	3	●	3	●	3	●	4	●	4
LONG	LG							●	3	●	3	●	1	●	4	●	4
MONITOR	MV							●	1	●	1	●	3	●	6	●	6
MULESHOE	MS	●	3	●	2	●	2	●	2	●	2	●	2	●	3	●	3
NEWARK	NK							●	0	●	0	●	1	●	5	●	5
PAHROC	PA	●	1	●	1	●	1	●	1	●	1	●	1	●	3	●	3
PENOYER	PN	●	9	●	4	●	4	●	4	●	4	●	4	●	5	●	5
RAILROAD	RR	●	17	●	21	●	21	●	21	●	21	●	19	●	13	●	13
RALSTON	RV	●	–	●	9	●	9			●	5	●	9	●	9	●	9
REVEILLE	RE	●	9	●	4	●	4	●	4	●	4	●	2	●	3	●	3
SPRING	SP	●	7	●	4	●	4	●	7	●	3	●	3	●	4	●	4
STEPTOE	SO	●	–			●	0	●	0	●	0	●	0	●	2	●	2*
STONE CABIN	ST	●	–	●	7	●	8	●	8	●	8	●	7	●	8	●	8
WHITE RIVER	WR	●	12	●	9	●	9	●	9	●	9	●	8	●	12	●	12
NV SUBTOTAL		16	136	21	139	22	139	26	137	27	137	28	136	28	166	28	164
TOTAL SYSTEMS		24	200	29	197	30	197	34	200	35	200	37	196	37	227	36	225

EXPLANATION

- ● VALLEYS UNDER STUDY
- – VALLEYS UNDER STUDY; NOT CLUSTERED

* STEPTOE VALLEY DELETED FROM FURTHER STUDIES AS OF SEPTEMBER 1981. THE CLUSTER COUNT WAS NOT REFLECTED IN THE TOTAL.

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23/1 CLUSTERING–REGIONAL STUDIES
SUMMARY OF MPS/HSS
CLUSTER COUNTS

30 NOV 81 TABLE 4-2

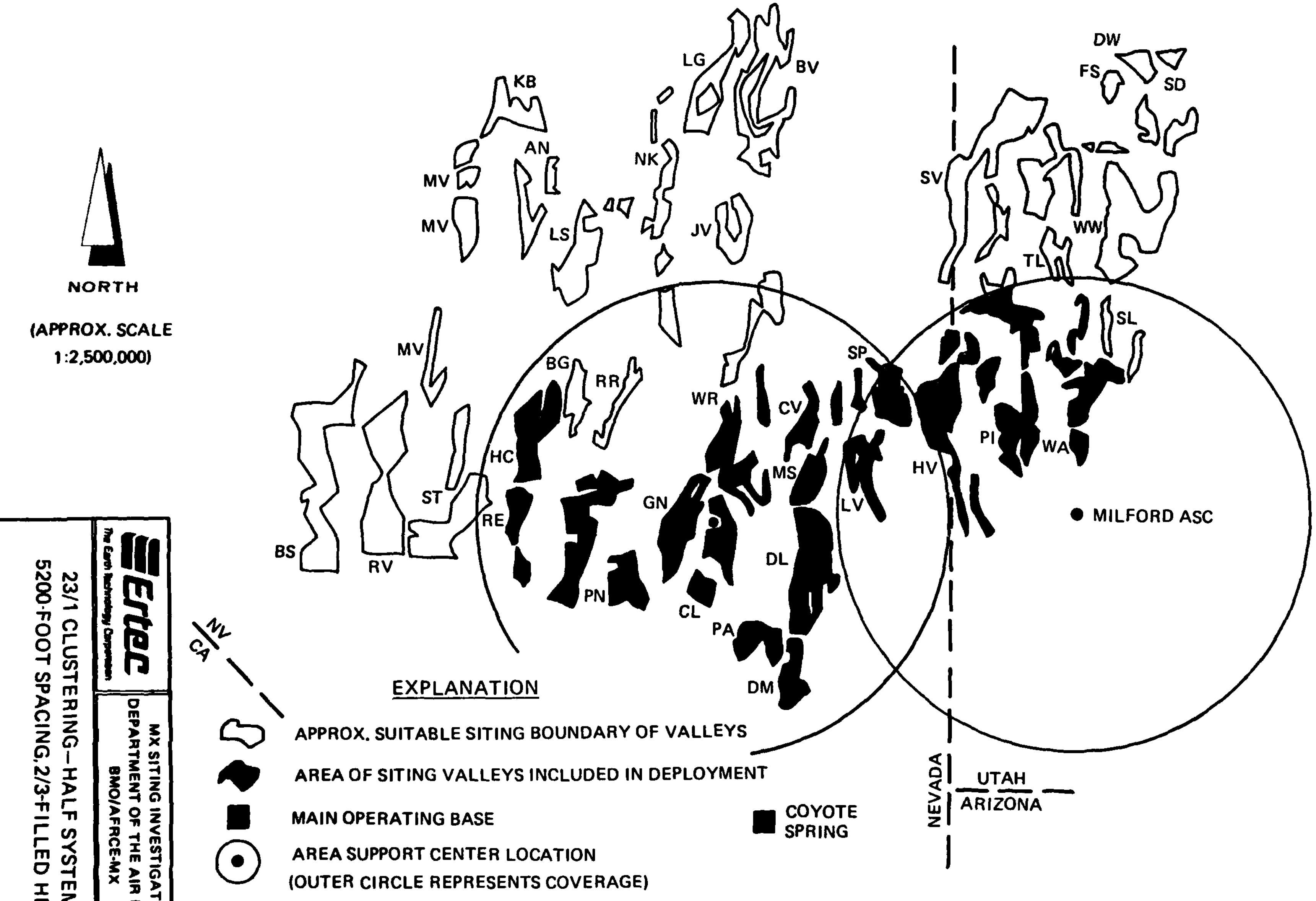
- 30 November 1981 - This regional map is a summary of the latest direct connect CRN clustering including the field revised IOC valleys and DTN. The layouts were transferred from 1:62,500 layouts to this regional map which was presented in Section 4.4 of the General Introduction. Steptoe Valley was deleted as of September, 1981.

The continuing concern for overall system cost reduction resulted in an inquiry as to the extent of a 2300-shelter (or half the original 4600 shelter system) system would be. This study was conducted using the 15 May 1981, 1:62,500 scale layout cluster/shelter counts as input. The resulting half system is depicted in the sketch map in Figure 4-2. Table 4-3 summarizes the state, valley, cluster/shelter counts. Generally, by reducing the system to 2300 shelters, the number of facilities (MPS/HSSs, CMFs, barriers, CRNs) are reduced by 50 percent with substantial reductions in DTN length.

4.1.2 Valley Clustering Studies

Ertec was directed by the AFRCE-MX to examine various valley clustering scenarios. The scenarios encompassed both horizontal and vertical shelters, 2/3-filled and full hexagonal pattern and under a variety of conditions. The full list of conditions appears in Appendix F. The main purpose was to estimate the extent of a valley clustered MX system for a full system of 4600 shelters and modified systems using one half and one-quarter of the original number of shelters.

The study was conducted using 1:500,000 scale maps. The shelter counts were estimated by multiplying Ertec's 15 May 1980 23/1 cluster/shelter counts by a multiplier factor provided by TRW in a memo (3500.RFS. 81-2205, dated 21 April



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23/1 CLUSTERING—HALF SYSTEM
5200-FOOT SPACING, 2/3-FILLED HEX

30 NOV 81

FIGURE 4-2

	CLUSTER COUNTS[1]		SHELTER COUNTS[1]	
UTAH	FULL SYSTEM	HALF SYSTEM	FULL SYSTEM	HALF SYSTEM
1. DUGWAY DW	5		115	
2. FISH SPRINGS FLAT FS	2		46	
3. PINE PI	5	5	115	115
4. SEVIER DESERT SD	2		46	
5. SEVIER LAKE SL	1		23	
6. SNAKE SV	19	4	437	92
7. TULE TL	10[4]	2	230[4]	46
8. WAH WAH WA	5	5	115	115
9. WHIRLWIND WW	12		276	
UT SUBTOTAL	61	16	1403	368
NEVADA				
1. ANTELOPE AN	4		92	
2. BIG SAND SPRINGS BG	3		69	
3. BIG SMOKY BS	10		230	
4. BUTTE BV	9		207	
5. CAVE CV	3	3	69	69
6. COAL CL	6	6[4]	138	138[4]
7. DELAMAR DM	3	6[2]	69	138[2]
8. DRY LAKE DL	10	10	230	230
9. GARDEN GN	6	6	138	138
10. HAMLIN HV	10	10	230	230
11. HOT CREEK HC	6	6	138	138
12. JAKES JV	3		69	
13. KOBEH KB	5		115	
14. LAKE LV	7	7	161	161
15. LITTLE SMOKY LS	4		92	
16. LONG LG	4		92	
17. MONITOR MV	6		138	
18. MULESHOE MS	3[4]	3	69[4]	69
19. NEWARK NK	5[4]		115[4]	
20. PAHROC PA	3		69	
21. PENOYER PN	5	15	115	115
22. RAILROAD RR	13	8	299	184
23. RALSTON RV	9		207	
24. REVEILLE RE	3	3	69	69
25. SPRING SP	4	4	92	92
26. STEPTOE SO	(2)[3]		(46)[3]	
27. STONE CABIN ST	8[4]		184[4]	
28. WHITE RIVER WR	12	9	276	207
NV SUBTOTAL	164[3]	86	3772[3]	1978
TOTAL	225	102	5175	2346
TOTAL ASCS	4	2[5]	4	2[5]

NOTES:

1. FULL AND HALF SYSTEM PLUS 13% FOR ANTICIPATED ATTRITION; 5200 FOOT SPACING, 2/3-FILLED HEXAGONAL PATTERN
2. COMBINED TOTAL FOR DELAMAR/PAHROC VALLEYS
3. STEPTOE FIGURES ARE NOT INCLUDED IN TOTAL
4. ASC LOCATED IN THIS VALLEY
5. THE SECOND ASC IS LOCATED IN MILFORD

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23/1 CLUSTERING - REGIONAL STUDIES

SUMMARY OF CLUSTER AND SHELTER COUNTS FOR FULL AND HALF SYSTEMS

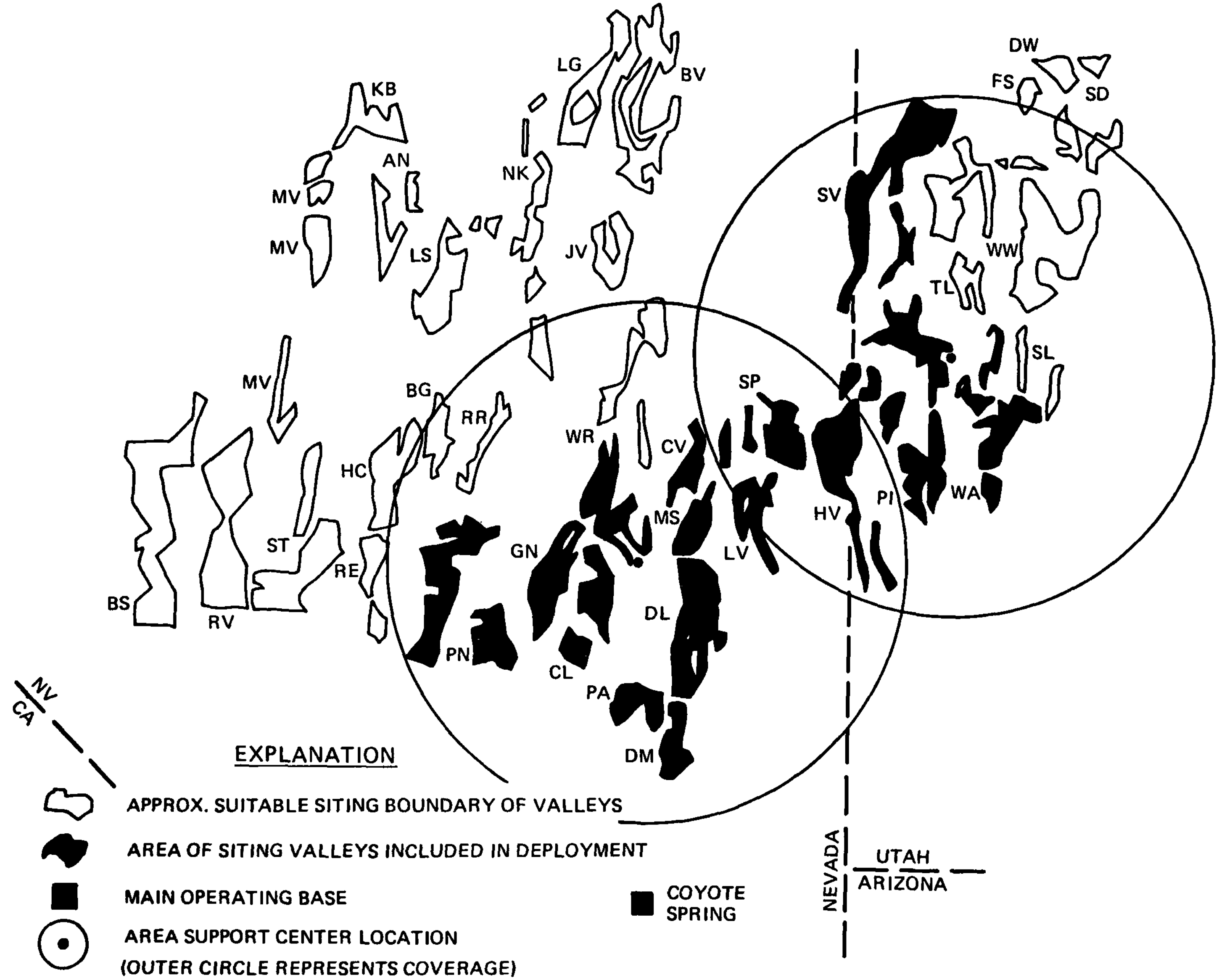
30 NOV 81 TABLE 4-3

1981). To assure quality control, the suitable area in 26 valleys was calculated by counting grid squares and planimetering. These figures were then compared with the values generated by TRW. A tabular summary of the study results can be found in Appendix F. The results of the study were presented in a book of diagrams using tabular and graphic formats. Figures 4-3 through 4-5 are examples of 5200-foot (1585-m) spacing, full hexagonal valley clustering using a Coyote Spring MOB for 4600, 2300, and 1150 shelters, respectively. The summary shelter count (Table 4-4) has been reformulated for this report.

Although limited in terms of numerical precision, the book of diagrams demonstrates potential system cost reductions could be significant if valley clustering were adopted. Valley clustering would reduce the extent of the system, thus reducing the DTN length and the number of support facilities.

4.2 CONCEPTUAL LAYOUTS AT 1:62,500

In contrast to the regional studies which focused on the overall system, the 1:62,500 conceptual layouts were concerned with the spatial relationships within an individual valley. Operational, geotechnical, environmental, and geographical data were integrated via map overlays registered to a topographic base map. Using the hexagonal grid and the modified QD templates, the MPS/HSS layouts were compiled assuming a Coyote MOB. Once compiled, the layouts were subjected to mathematical checks to assure the shelter geometry (i.e., spacing and



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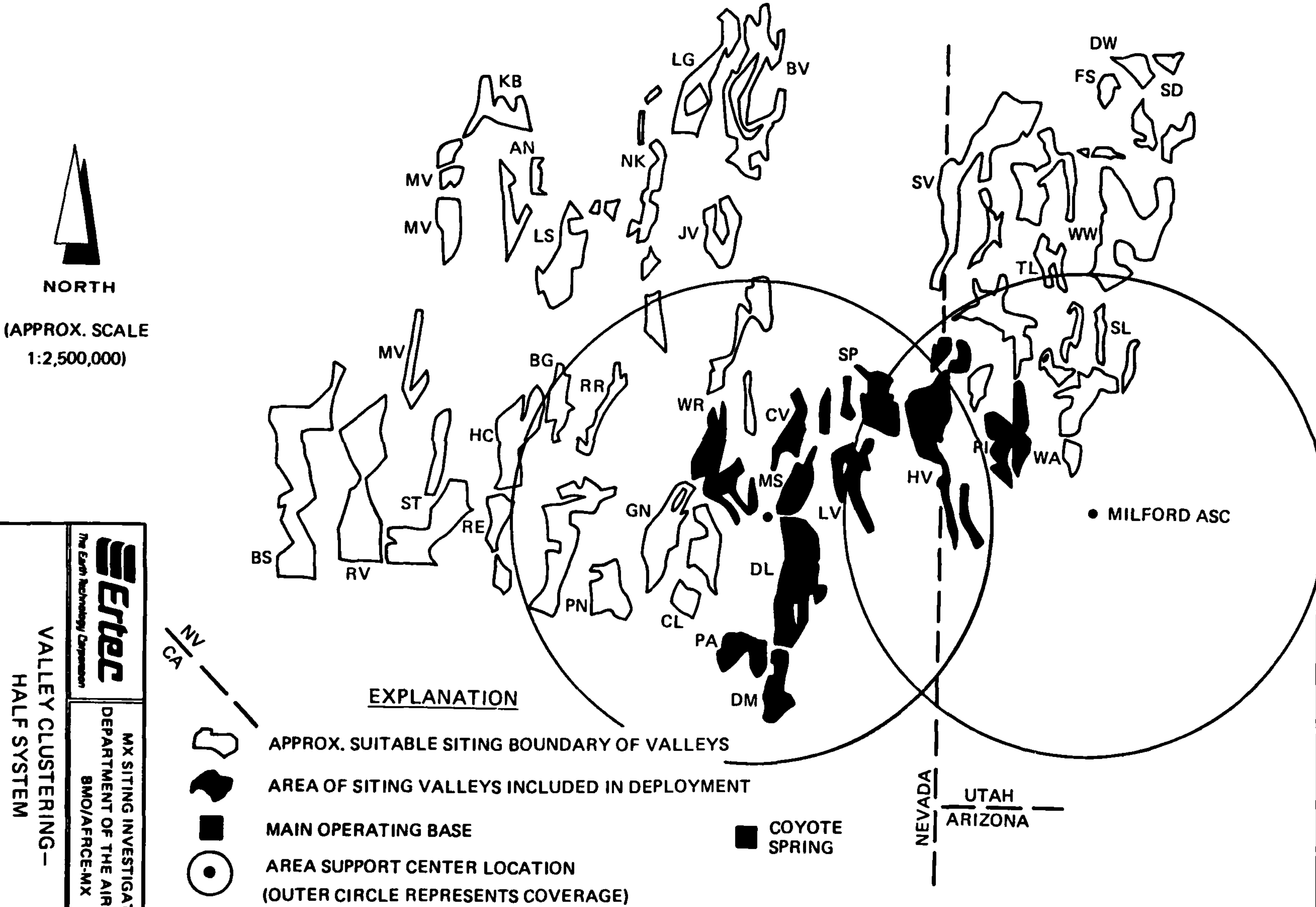
VALLEY CLUSTERING–FULL SYSTEM
5200-FOOT SPACING, FULL HEX

30 NOV 81

FIGURE 4-3



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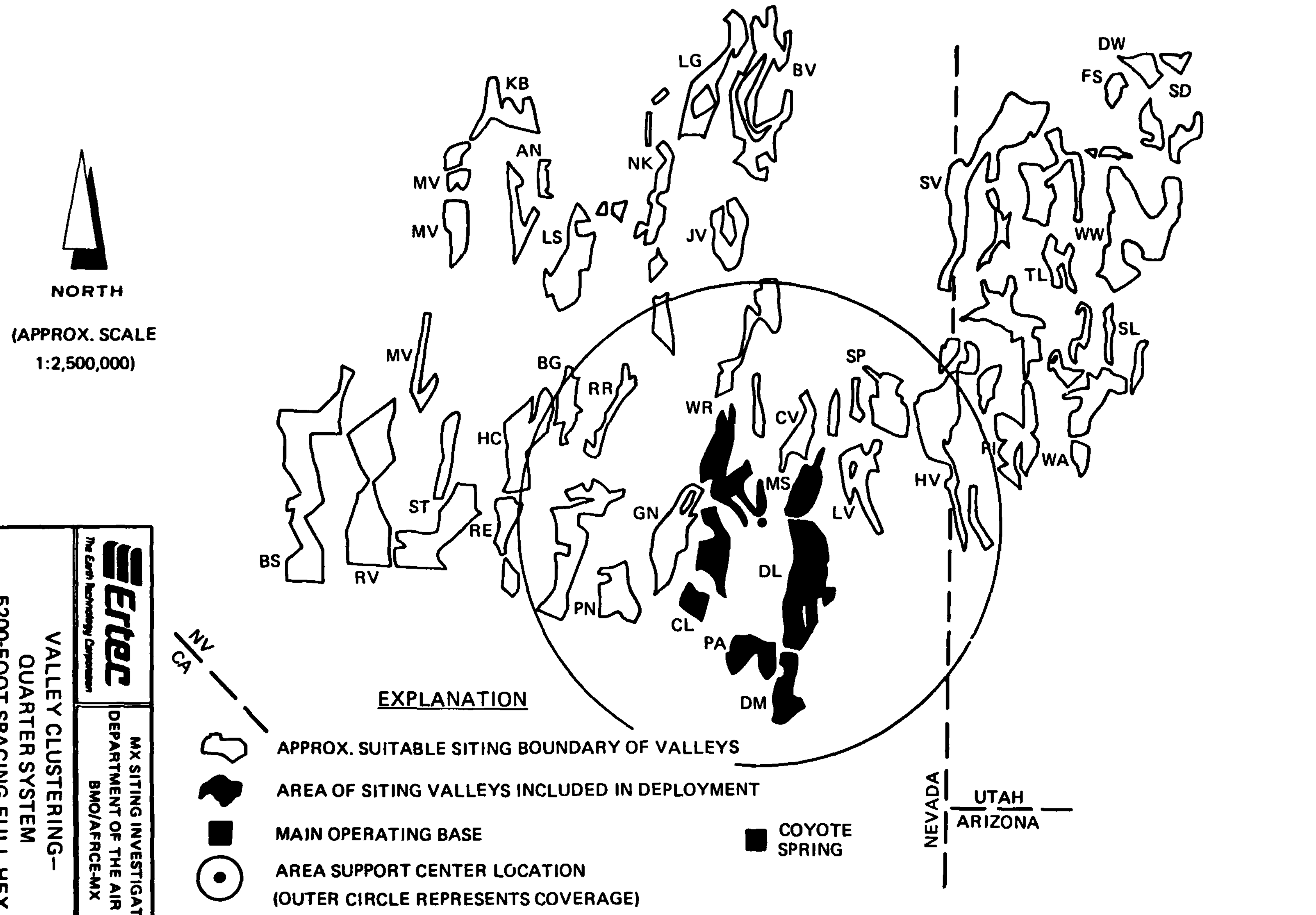
VALLEY CLUSTERING–
HALF SYSTEM
5200-FOOT SPACING, FULL HEX

30 NOV 31

FIGURE 4-4



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VALLEY CLUSTERING—
QUARTER SYSTEM
5200-FOOT SPACING, FULL HEX

30 NOV 81

FIGURE 4-5

		FULL SYSTEM SHELTER COUNT	HALF SYSTEM SHELTER COUNT	QUARTER SYSTEM SHELTER COUNT
UTAH				
DUGWAY	DW			
FISH SPRINGS FLAT	FS			
PINE	PI	374	374	
SEVIER DESERT	SD			
SEVIER LAKE	SL			
SNAKE	SV	975		
TULE	TL	116*		
WAH WAH	WA	320		
WHIRLWIND	WW			
NEVADA				
ANTELOPE	AN			
BIG SAND SPRINGS	BG			
BIG SMOKY	BS			
BUTTE	BV			
CAVE	CV	118	118	
COAL	CL	328		328
DELAMAR/PAHROC	DM/PA	255	255	255
DRY LAKE	DL	426	426	426
GARDEN	GN	242		
HAMLIN	HV	500	500	
HOT CREEK	HC			
JAKES	JV			
KOBEH	KB			
LAKE	LV	286	286	
LITTLE SMOKY	LS			
LONG	LG			
MONITOR	MV			122
MULESHOE	MS	122	122*	
NEWARK	NK			
PENOYER	PN	318		
RAILROAD	RR	410		
RALSTON	RV			
REVEILLE	RE			
SPRING	SP	182	182	
STONE CABIN	ST			
WHITE RIVER	WR	398*	398	398*
	TOTAL SHELTERS	5370	2661	529
	TOTAL VALLEYS	16	9	5
	TOTAL ASCs	2	2**	1

NOTES:
*ASCs ARE LOCATED IN THESE VALLEYS
**THE SECOND ASC IS LOCATED IN MILFORD

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VALLEY CLUSTERING - REGIONAL STUDY
SUMMARY OF HORIZONTAL SHELTER COUNTS

30 NOV 81 TABLE 4-4

orientation). Tabulations of siting requirement violations and qualifying notes were made and entered into the corresponding valley files. These data and a copy of the layout were utilized in the technical/operational siting reviews.

4.2.1 Layouts at 23 Shelters per Cluster (23/1)

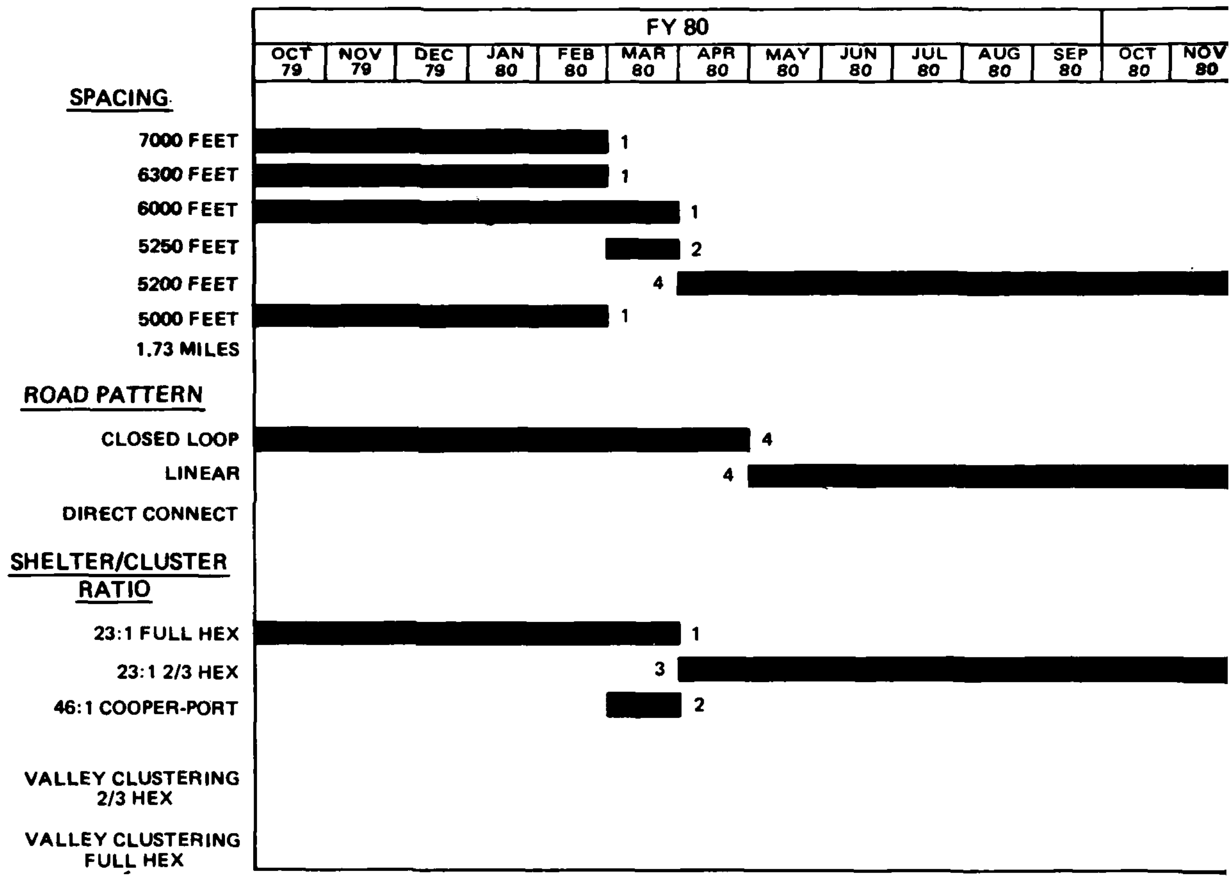
Conceptual layouts were compiled for Dry Lake Valley, Nevada, in the spring of 1979. These layouts were based on terrain and geotechnical conditions using 7000-, 6300-, 6000-, and 5000-foot (2134-, 1920-, 1829-, and 1524-m) spacings, using a loop CRN (FN-TR-32).

In March 1980, the AFRCE-MX initiated the Cooper-Port backfill concept which imposed the following siting requirements.

- o Average spacing (5250 feet [1600 m]);
- o Average number of sites per cluster: 26; and
- o 23 best primary sites, 23 backfill sites.

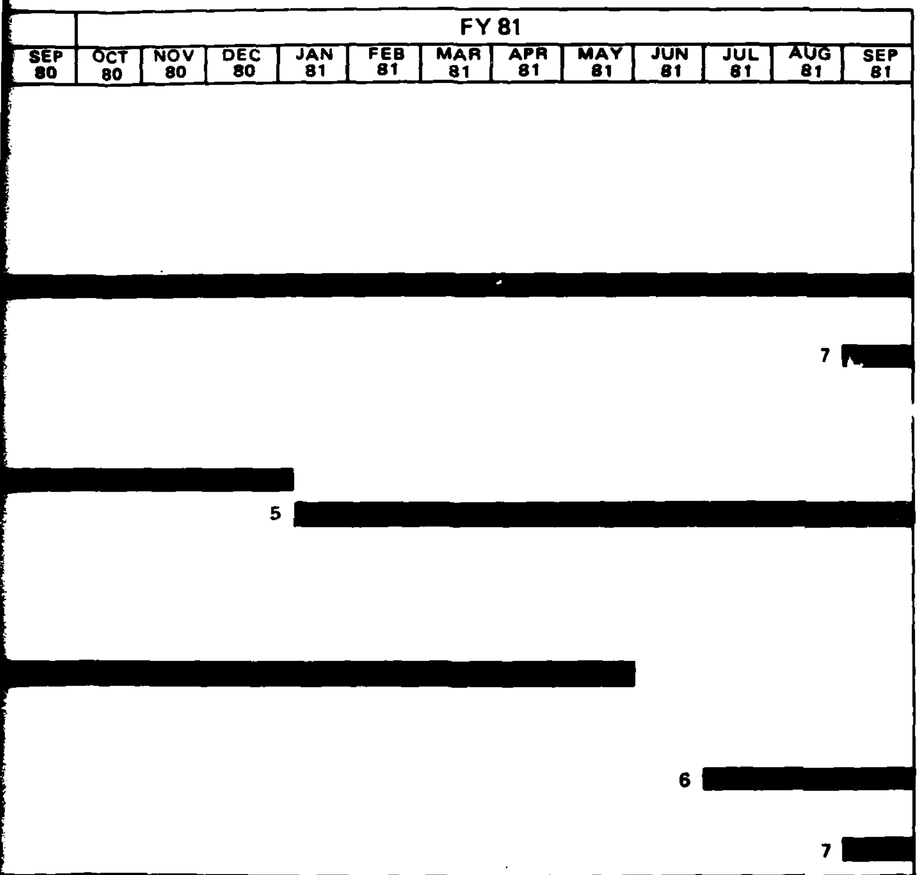
This concept was modified on 23 April 1980 to a new baseline which called for a loop CRN, 5200-foot (1585-m) spacing, 2/3-filled hexagon, 23 shelters, and 11 or 12 backfills per cluster.

On 12 May 1980, a new baseline was established which required a straight trunk CRN. Further system cost considerations resulted in another baseline change to the direct connect CRN. This baseline configuration served as the basis for the 15 May 1981 delivery of 37 valley layouts to the AFRCE-MX. Figure 4-6 summarizes more of the changes and considerations affecting the layout compilations since October 1979.



FOOTNOTES

1. 22 OCTOBER 79 — BMO REVISED GROUND RULES FOR SITING LAYOUTS – DIRECTIVE T OF 7000 FEET, 6000 FEET, AND 5000 FEET ±10% AVERAGE SPACING, IN UTAH WITH REMAINDER IN NEVADA AND SITE 23 PROTECTIVE S
2. 5 MARCH 80 — REQUESTED BY AFRCE-MX FOR CONCEPTUAL LAYOUTS USING COO
3. 18 APRIL 80 — MEMORANDUM FROM AFRCE-MX RECOMMENDING SELECTION OF 2/ AS BASELINE
4. 12 MAY 80 — TRW MX BASING CONCEPT UPDATE – ESTABLISHES 5200-FOOT 2/3-F BASELINE. CHANGES ROAD CONFIGURATION FROM LOOP TO LINEA
5. 7 JANUARY 81 — MX BASELINE CHANGE FROM LINEAR TO DIRECT CONNECT CRN
6. 4 JUNE 81 — REQUESTED BY AFRCE-MX FOR CONCEPTUAL LAYOUTS USING VAL MULESHOE, HOT CREEK, LAKE AND SPRING VALLEYS
7. 8 SEPTEMBER 81 — REQUESTED BY AFRCE-MX FOR CONCEPTUAL LAYOUTS IN DRY LA AND FULL HEX VALLEY CLUSTERING CONCEPT



TES

OUTS – DIRECTIVE TO HDR AND ERTEC TO USE SPACINGS
AVERAGE SPACING, PLACE AS MANY CLUSTERS AS POSSIBLE
TE 23 PROTECTIVE STRUCTURES (HSS) PER CLUSTER

AYOUTS USING COOPER-PORT BACKFILL CONCEPT

NG SELECTION OF 2/3-FILLED HEXAGONAL MPS LAYOUT

HES 5200-FOOT 2/3-FILLED HEXAGONAL MPS LAYOUT AS
ROM LOOP TO LINEAR

T CONNECT CRN

AYOUTS USING VALLEY CLUSTERING CONCEPT IN IOC,
LLEYS

AYOUTS IN DRY LAKE VALLEY USING 1.73 MILE SPACING
T

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CHANGES AND CONSIDERATIONS
OF SHELTER LAYOUT CONCEPTS

30 NOV 81

FIGURE 4-6

The siting statistics for the 15 May 1981 deliverable are summarized in a series of tables and sketches. While it is beyond the scope of this summary report to detail the siting activities within the 37 valleys, the synoptic tabulations will convey some of the effort involved in the siting process. Table 4-5 indicates the last date of the geographical/environmental and geotechnical/operational guidelines used as input to compile the layouts. Because of the time frame involved to develop these conceptual layouts, a field check is required to update and reassess the validity of the layout.

The sketches of the conceptual layouts are grouped by neighboring valleys in their respective geographic relationship (Figures 4-7A through 4-7G). The graphic presentation of these sketch maps depict the boundary of the geotechnically suitable area, the CRN pattern, and the DTN within the valleys. Major conflicts with the siting requirements which influenced the layouts are noted in Figure 4-8 for several sample valleys. The occurrence of these factors for all 37 valleys are summarized in Table 4-6.

The series of histograms shown in Figure 4-9 further portray the frequency of these conflicts. These data were originally tabulated on checklists for each valley (Appendix D) and were included in the valley files to aid in the technical and operational reviews of the layouts. Based on the data available at the time of suitable area delineation and shelter layout development, all known areas of conflict with the siting requirements were deemed not suitable and thus were areas where no

DATES OF GEOTECHNICAL AND GEOGRAPHICAL/ENVIRONMENTAL INFORMATION USED IN THE COMPILATION OF THE 1:62,500 CONCEPTUAL LAYOUTS DELIVERED 15 MAY 1981

UTAH		GEOTECHNICAL	GEOGRAPHICAL/ ENVIRONMENTAL	SHELTER LAYOUT COMPLETION DATE
1. DUGWAY	DW	10-80	9-80	5-8-81
2. FISH SPRINGS FLAT	FS	9-80	9-24-80	4-23-81
3. PINE	PI	7-22-80	7-28-80	3-19-81
4. SEVIER DESERT	SD	10-20-80	10-21-80	2-26-81
5. SEVIER LAKE	SL	NONE	3-18-81	4-31-81
6. SNAKE	SV	9-16-80	9-23-80	4-9-81
7. TULE	TL	10-3-80	9-18-80	4-26-81
8. WAH WAH	WA	8-1-80	7-28-80	3-18-81
9. WHIRLWIND	WW	10-15-80	9-15-80	4-6-81

NEVADA		GEOTECHNICAL	GEOGRAPHICAL/ ENVIRONMENTAL	SHELTER LAYOUT COMPLETION DATE
1. ANTELOPE	AN	11-12-80	10-22-80	5-7-81
2. BIG SAND SPRINGS	BG	10-22-80	11-21-80	3-6-81
3. BIG SMOKY	BS	12-5-80	1-26-81	5-6-81
4. BUTTE	BV	3-9-81	2-18-81	5-13-81
5. CAVE	CV	9-10-80	8-1-80	3-25-81
6. COAL	CL	10-12-80	10-30-80	2-20-81
7. DELAMAR	DM	9-10-80	8-1-80	4-15-81
8. DRY LAKE	DL	7-80	7-31-80	3-23-81
9. GARDEN	GN	10-12-80	10-30-80	2-23-81
10. HAMLIN	HV	3-80	1-81	4-25-81
11. HOT CREEK	HC	11-26-80	11-21-80	2-21-81
12. JAKES	JV	12-20-80	1-26-81	5-1-81
13. KOBEH	KB	1-27-81	2-5-81	5-17-81
14. LAKE	LV	10-80	8-27-80	3-24-81
15. LITTLE SMOKY	LS	9-80	10-28-80	4-29-81
16. LONG	LG	3-6-81	2-9-81	4-30-81
17. MONITOR	MV	3-10-81	2-9-81	4-23-81
18. MULESHOE	MS	9-25-80	8-20-80	4-1-81
19. NEWARK	NK	3-12-81	2-3-81	5-8-81
20. PAHROC	PA	8-13-80	8-22-80	4-9-81
21. PENOYER	PN	10-15-80	9-30-80	3-4-81
22. RAILROAD	RR	11-80	12-4-80	4-10-81
23. RALSTON	RV	10-21-80	11-20-80	4-18-81
24. REVEILLE	RE	10-16-80	10-24-80	2-26-81
25. SPRING	SP	10-23-80	8-26-80	4-22-81
26. STEPTOE	SO	5-7-81	1-30-81	5-7-81
27. STONE CABIN	ST	1-16-81	2-18-81	4-22-81
28. WHITE RIVER	WR	11-80	10-4-80	4-23-81

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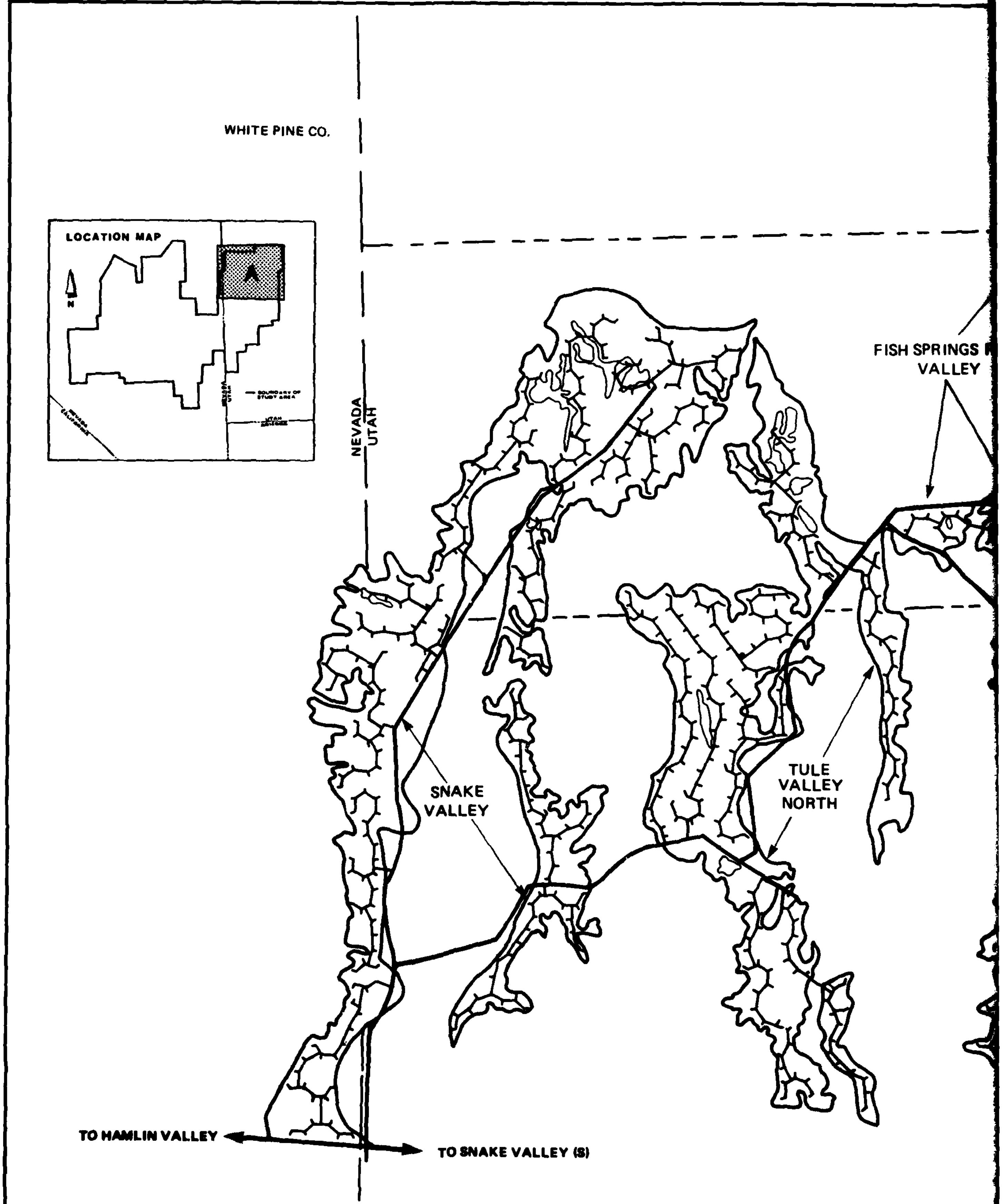
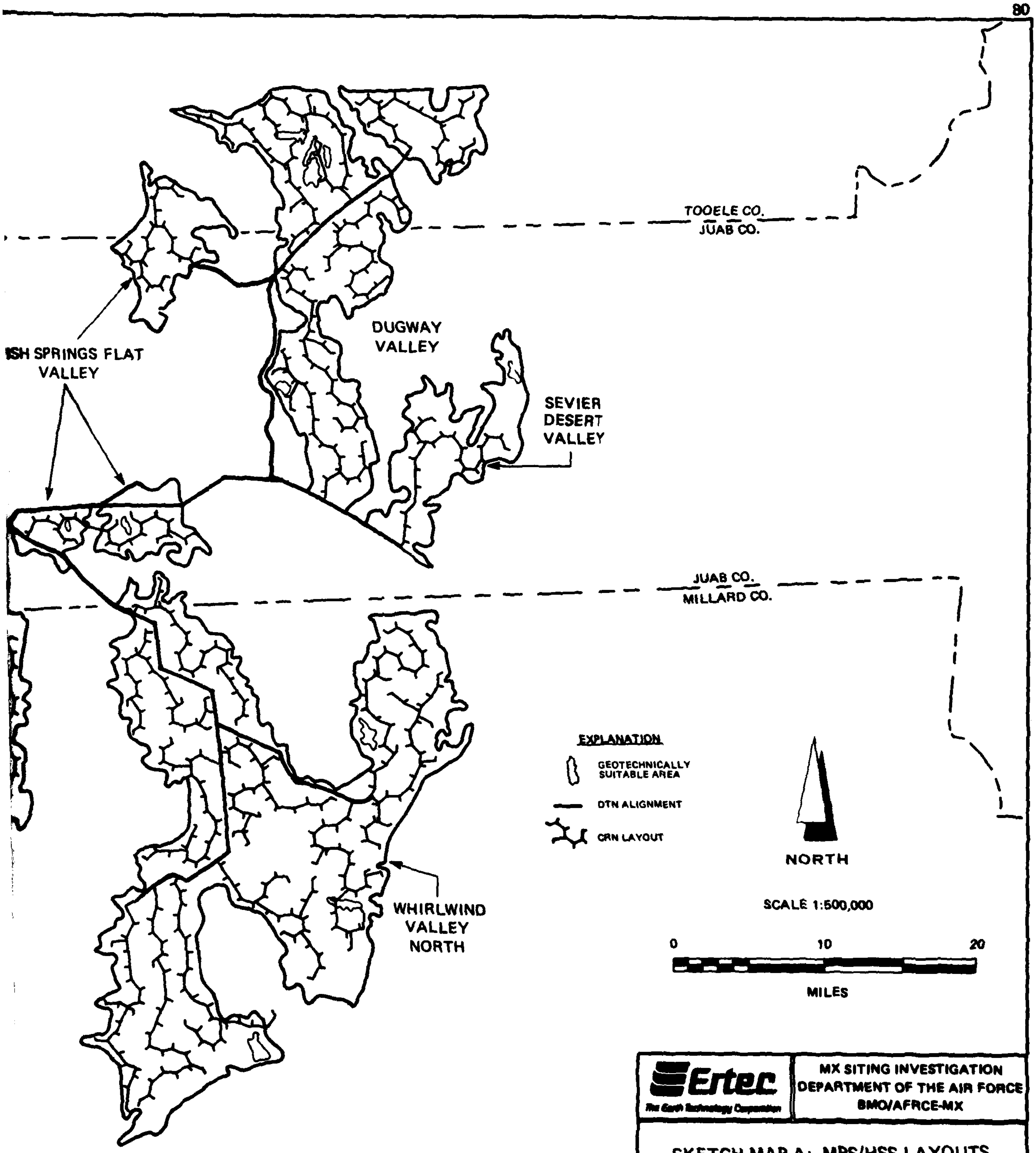
SUMMARY OF DATA INPUT TO 1:62,500 LAYOUTS (15 MAY 1981)

30 NOV 81 TABLE 4-5


WHITE PINE CO.
LOCATION MAP
N
A
BOUNDARY OF STUDY AREA
NEVADA
UTAH
FISH SPRINGS
VALLEY
SNAKE VALLEY
TULE VALLEY NORTH
TO HAMLIN VALLEY
TO SNAKE VALLEY (S)



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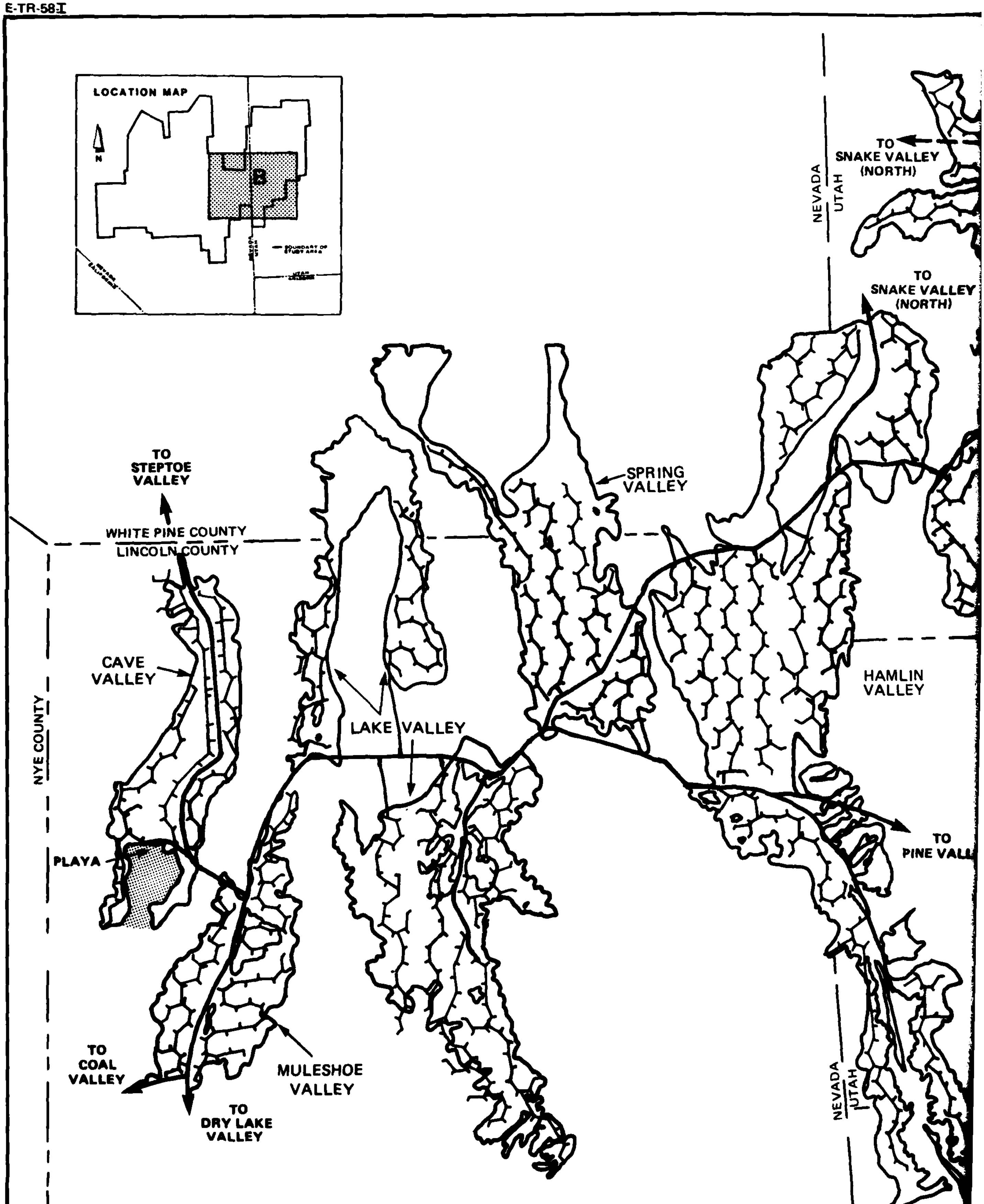
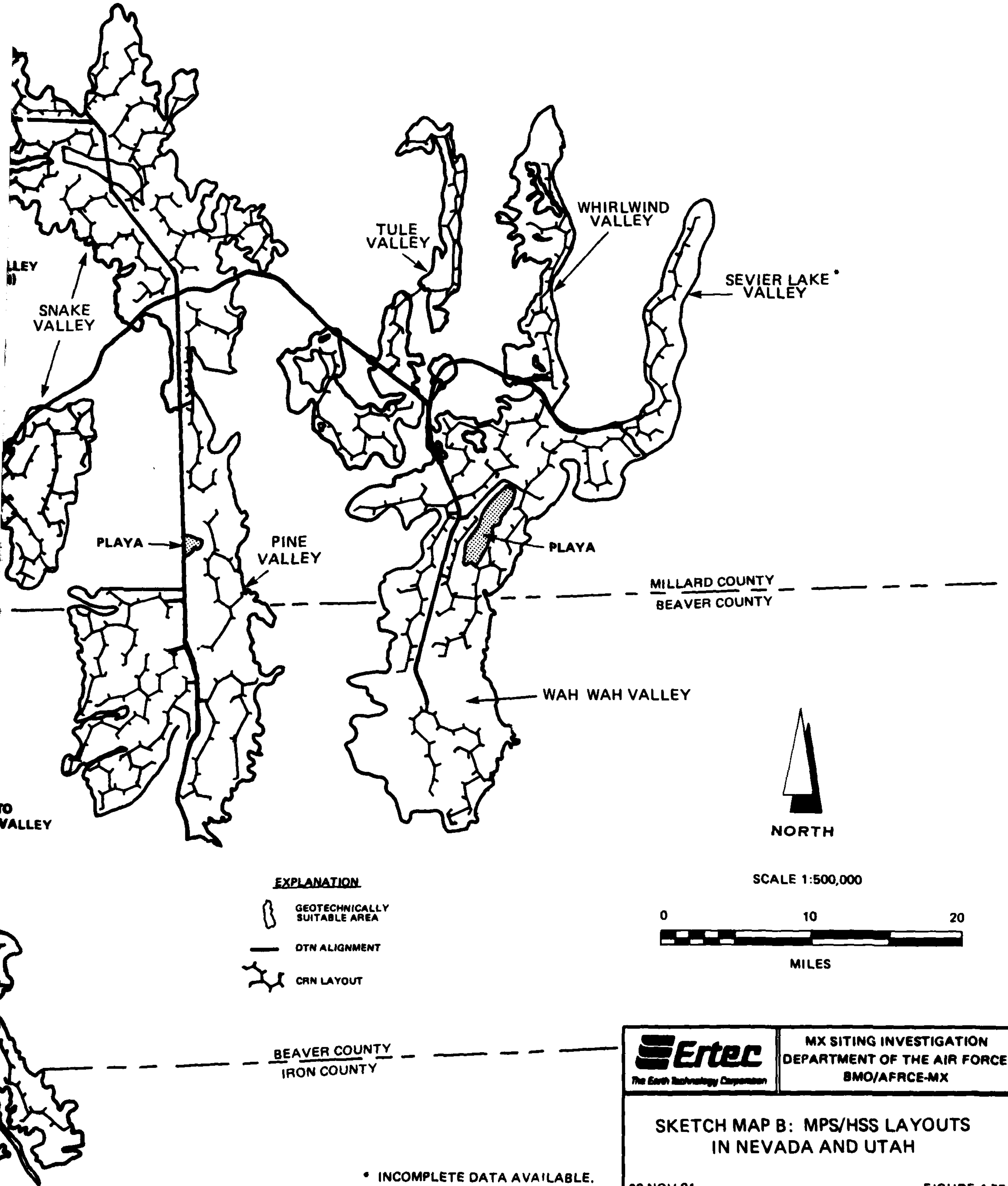
SKETCH MAP A: MPS/HSS LAYOUTS IN UTAH

30 NOV 81

FIGURE 4-7A


LOCATION MAP
N
TO SNAKE VALLEY (NORTH)
NEVADA
UTAH
TO SNAKE VALLEY (NORTH)
TO STEPTOE VALLEY
SPRING VALLEY
WHITE PINE COUNTY
LINCOLN COUNTY
CAVE VALLEY
HAMLIN VALLEY
NYE COUNTY
LAKE VALLEY
TO PINE VALL
PLAYA
TO COAL VALLEY
MULESHOE VALLEY
TO DRY LAKE VALLEY
NEVADA
UTAH



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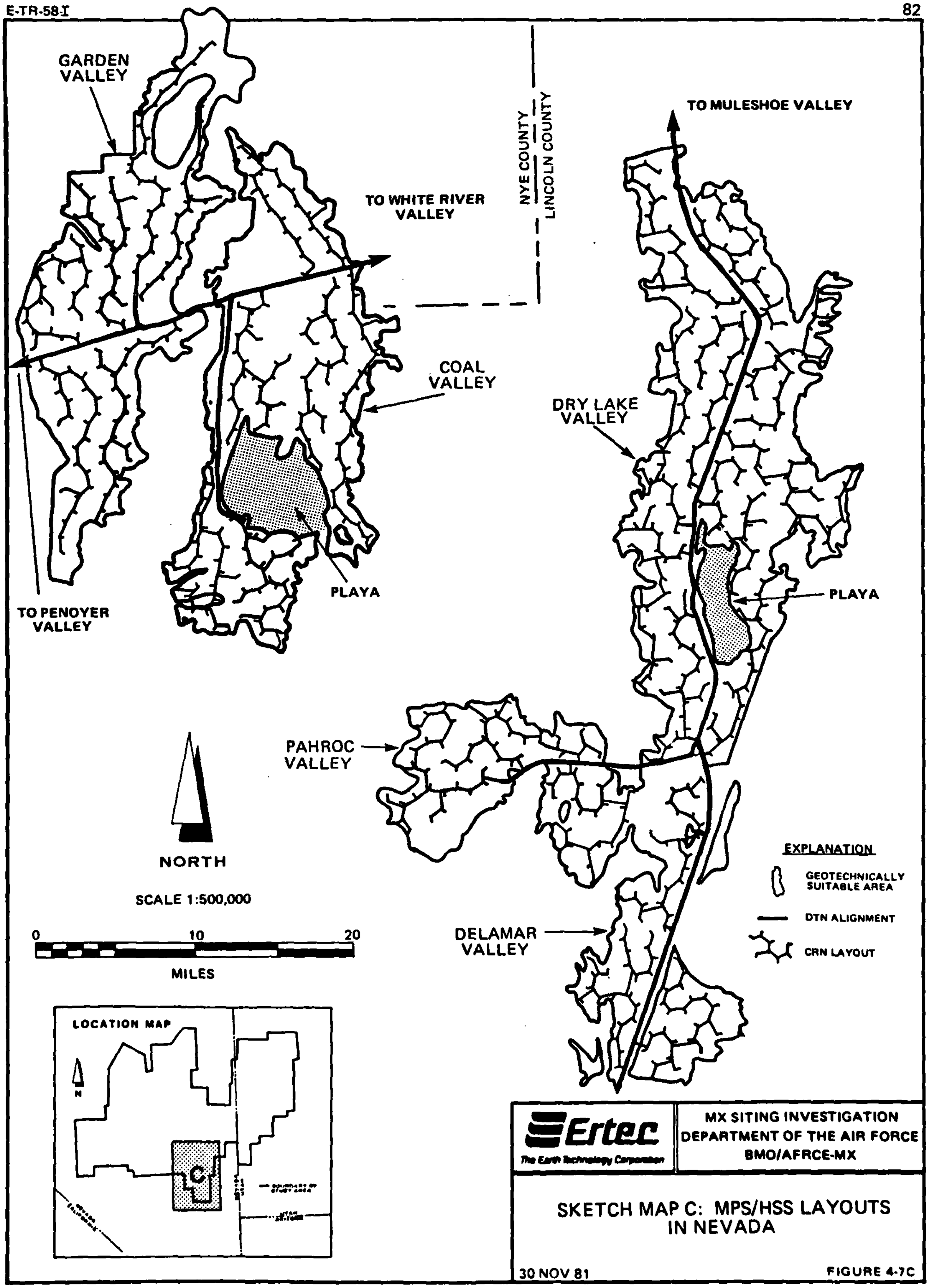
SKETCH MAP B: MPS/HSS LAYOUTS IN NEVADA AND UTAH

30 NOV 81

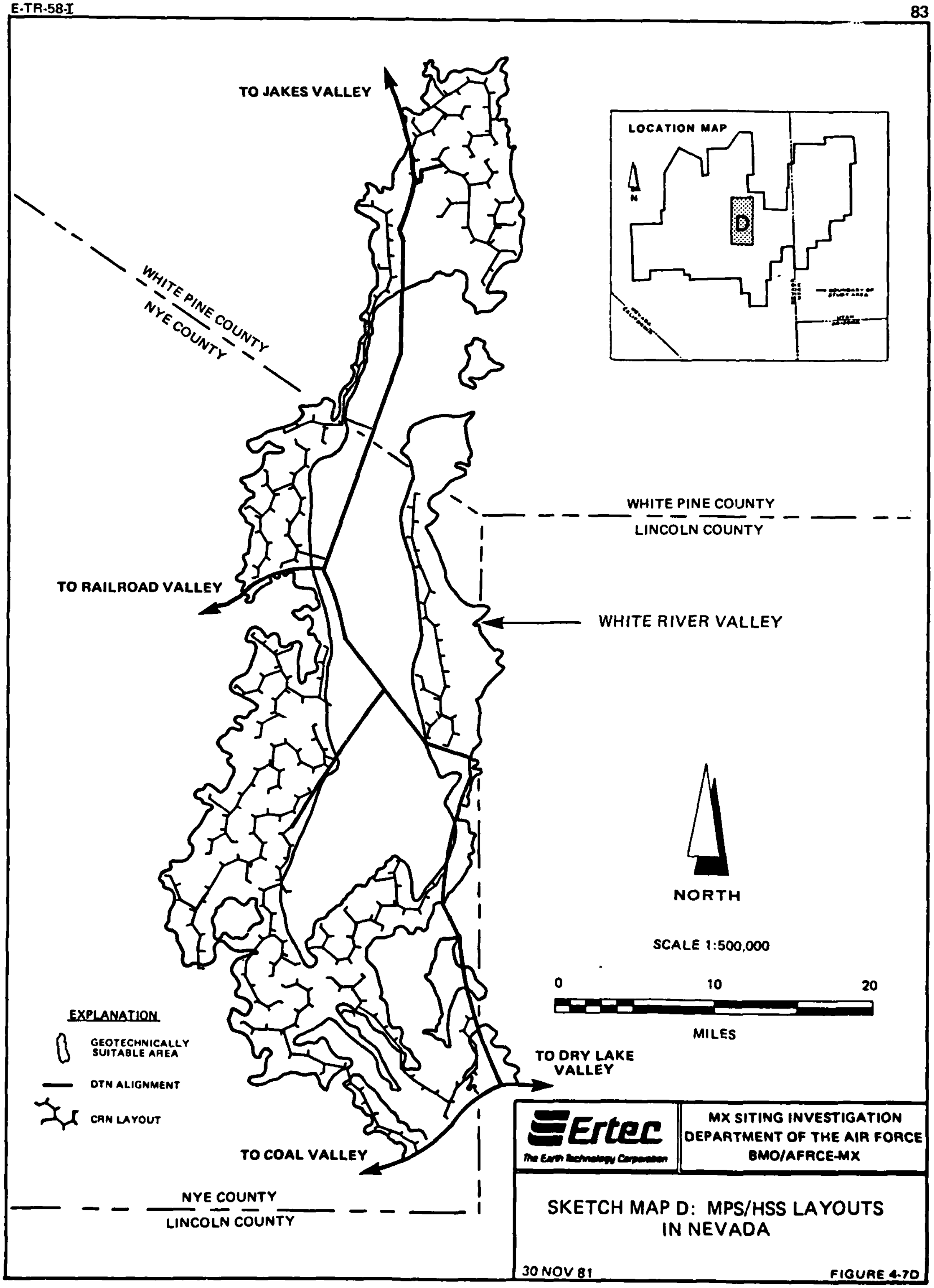
FIGURE 4-7B



SKETCH MAP C: MPS/HSS LAYOUTS IN NEVADA

30 NOV 81

FIGURE 4-7C



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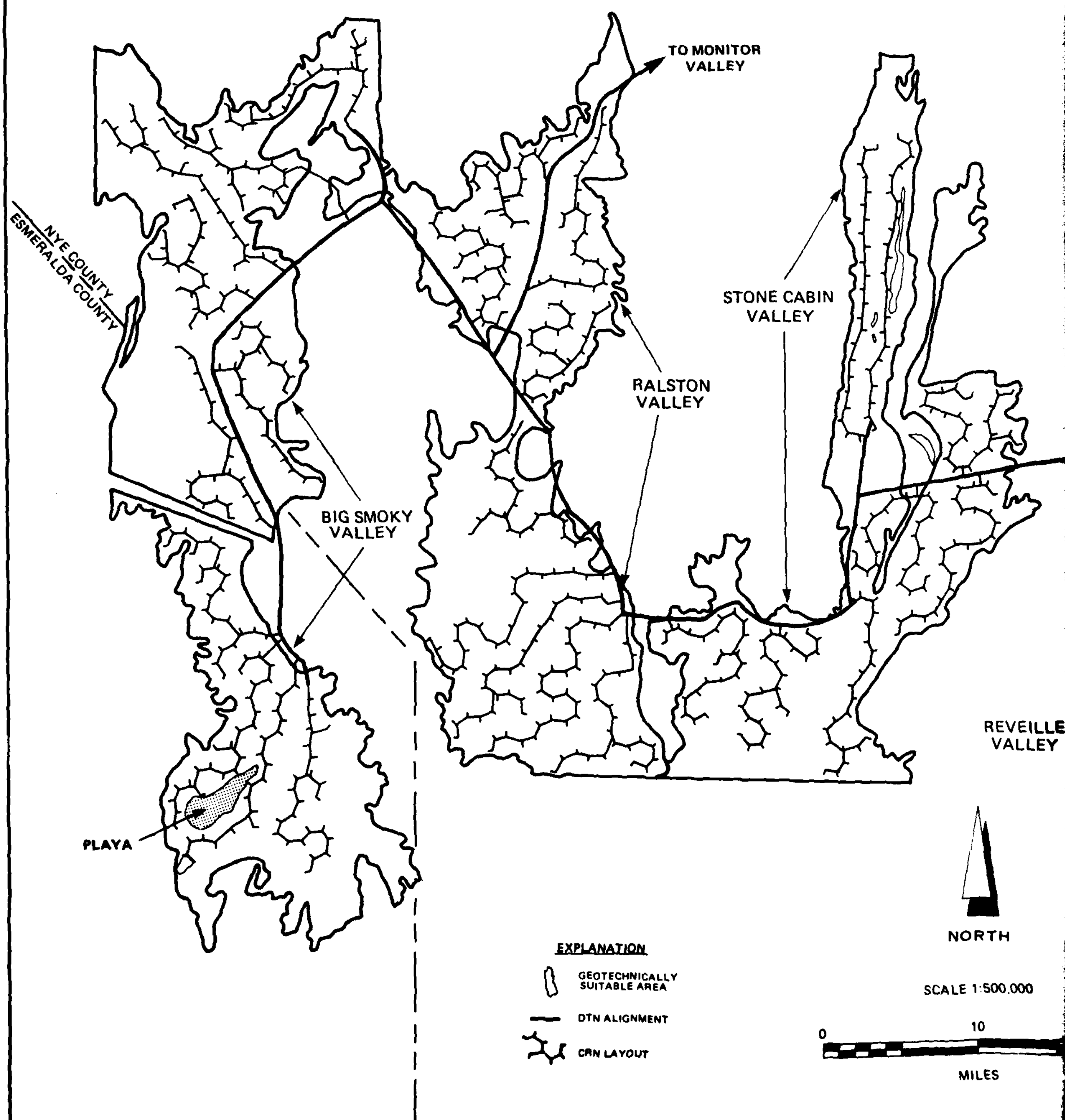
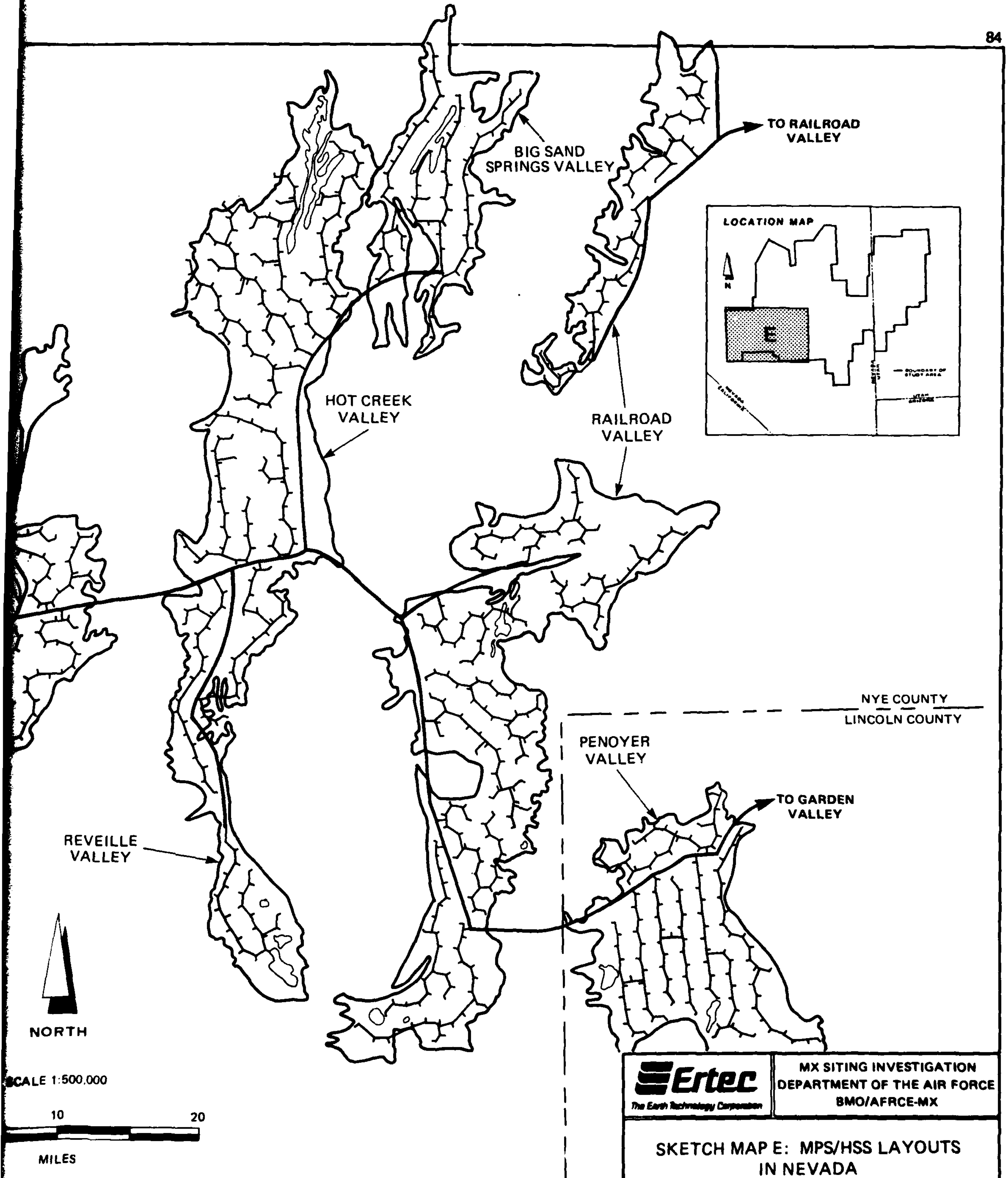
SKETCH MAP D: MPS/HSS LAYOUTS IN NEVADA

30 NOV 81

FIGURE 4-7D


TO MONITOR VALLEY
NYE COUNTY
ESMERALDA COUNTY
STONE CABIN VALLEY
RALSTON VALLEY
BIG SMOKY VALLEY
REVEILLE VALLEY
PLAYA
NORTH
EXPLANATION
GEOTECHNICALLY SUITABLE AREA
DTN ALIGNMENT
CRN LAYOUT
SCALE 1:500,000
0
10
MILES



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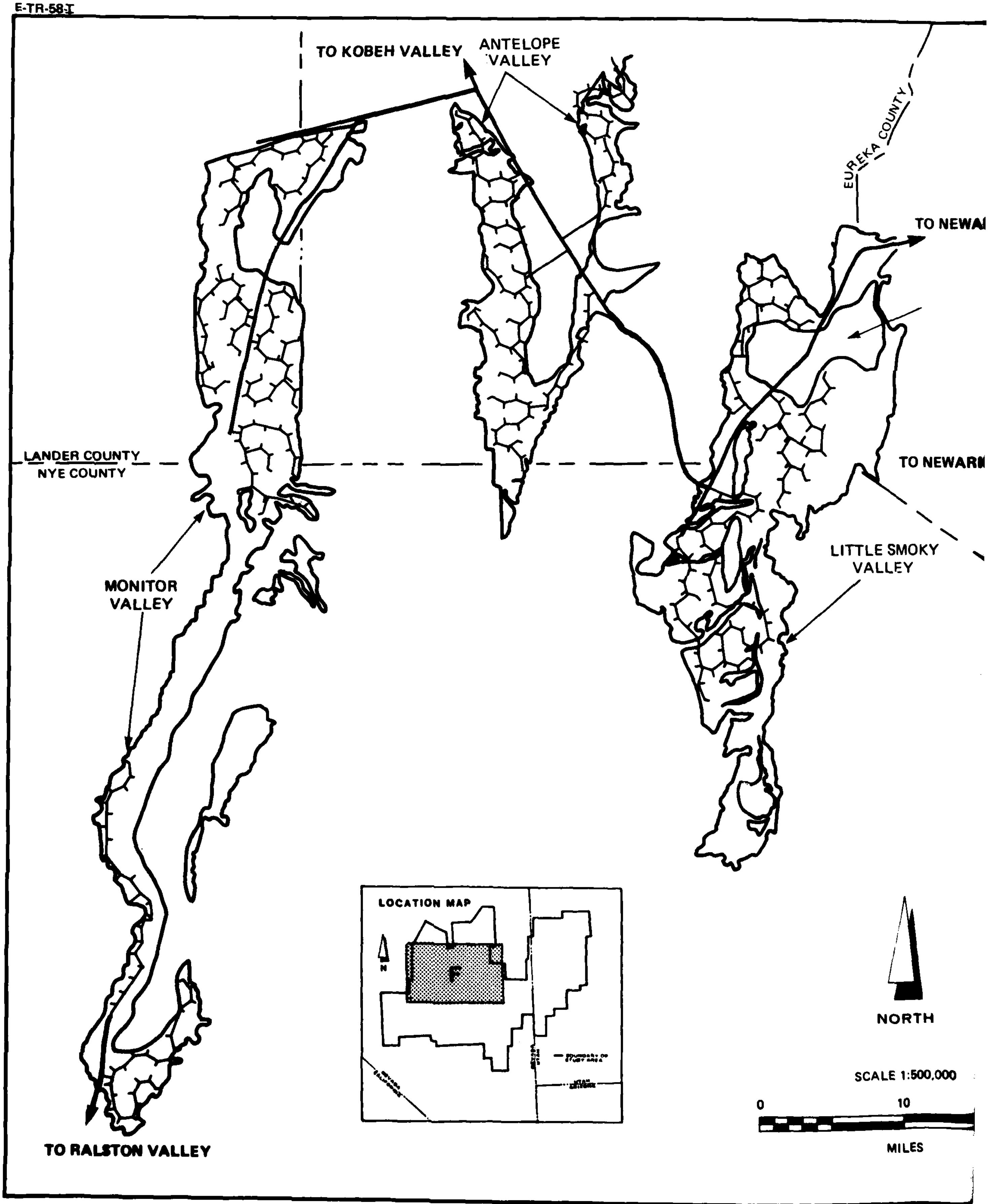
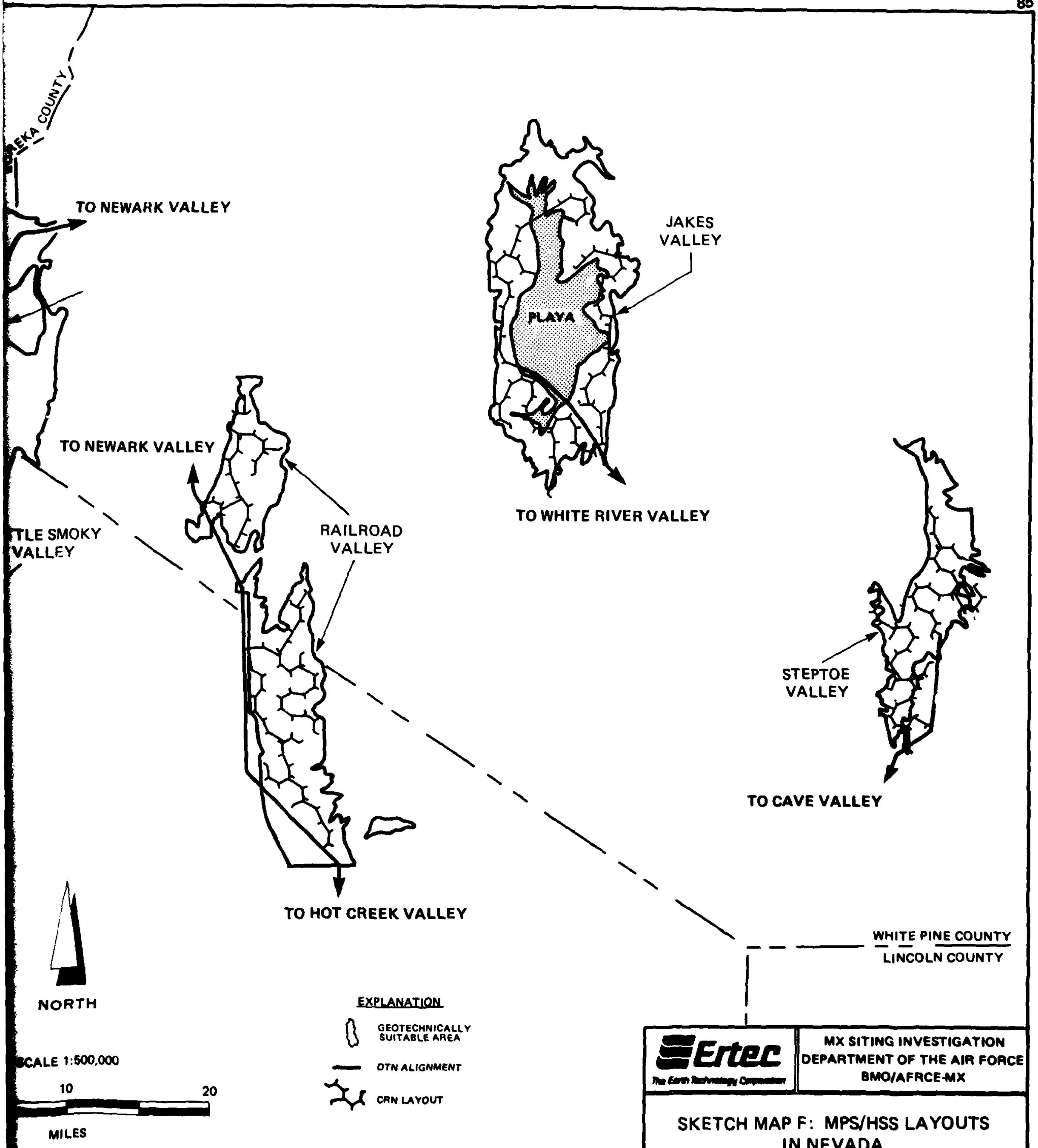
SKETCH MAP E: MPS/HSS LAYOUTS IN NEVADA

30 NOV 81

FIGURE 4-7E


TO KOBEH VALLEY
ANTELOPE VALLEY
EUREKA COUNTY
TO NEWA
LANDER COUNTY
NYE COUNTY
TO NEWARK
MONITOR VALLEY
LITTLE SMOKY VALLEY
LOCATION MAP
N
F
NORTH
SCALE 1:500,000
0
10
MILES
TO RALSTON VALLEY



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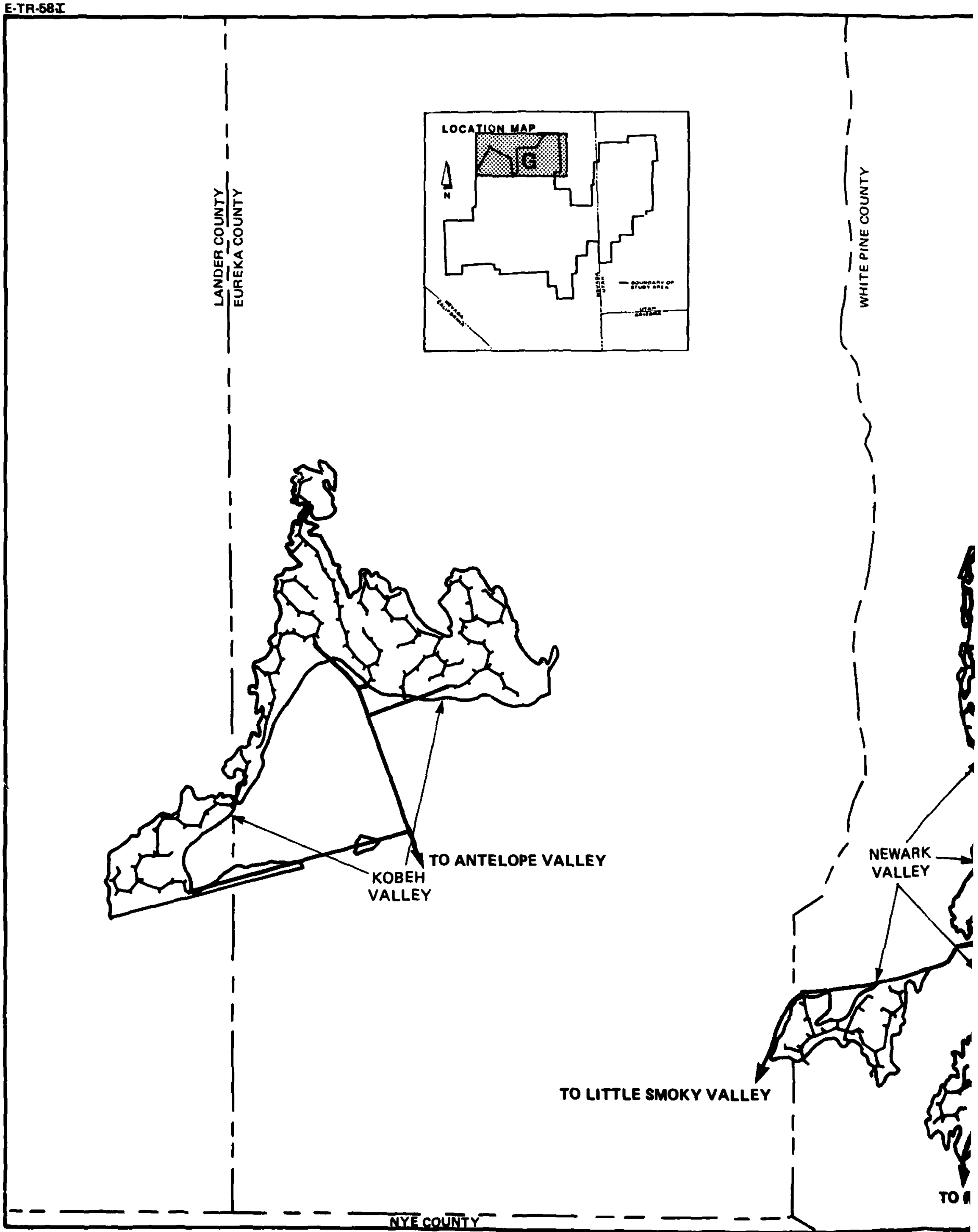
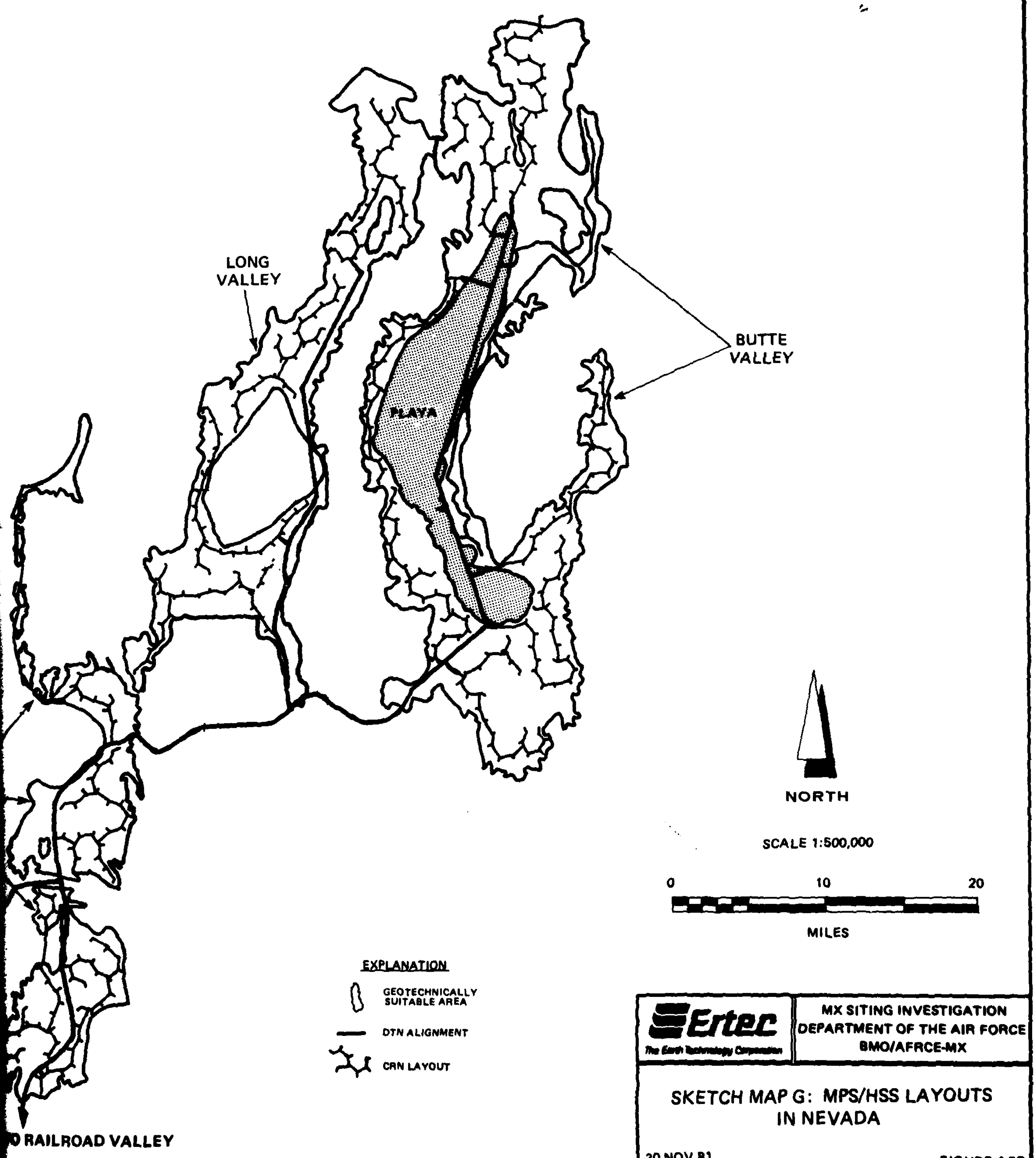
SKETCH MAP F: MPS/HSS LAYOUTS IN NEVADA

30 NOV 81

FIGURE 4-7F


LOCATION MAP
G
N
LANDER COUNTY
EUREKA COUNTY
WHITE PINE COUNTY
TO ANTELOPE VALLEY
KOBEH VALLEY
NEWARK VALLEY
TO LITTLE SMOKY VALLEY
NYE COUNTY



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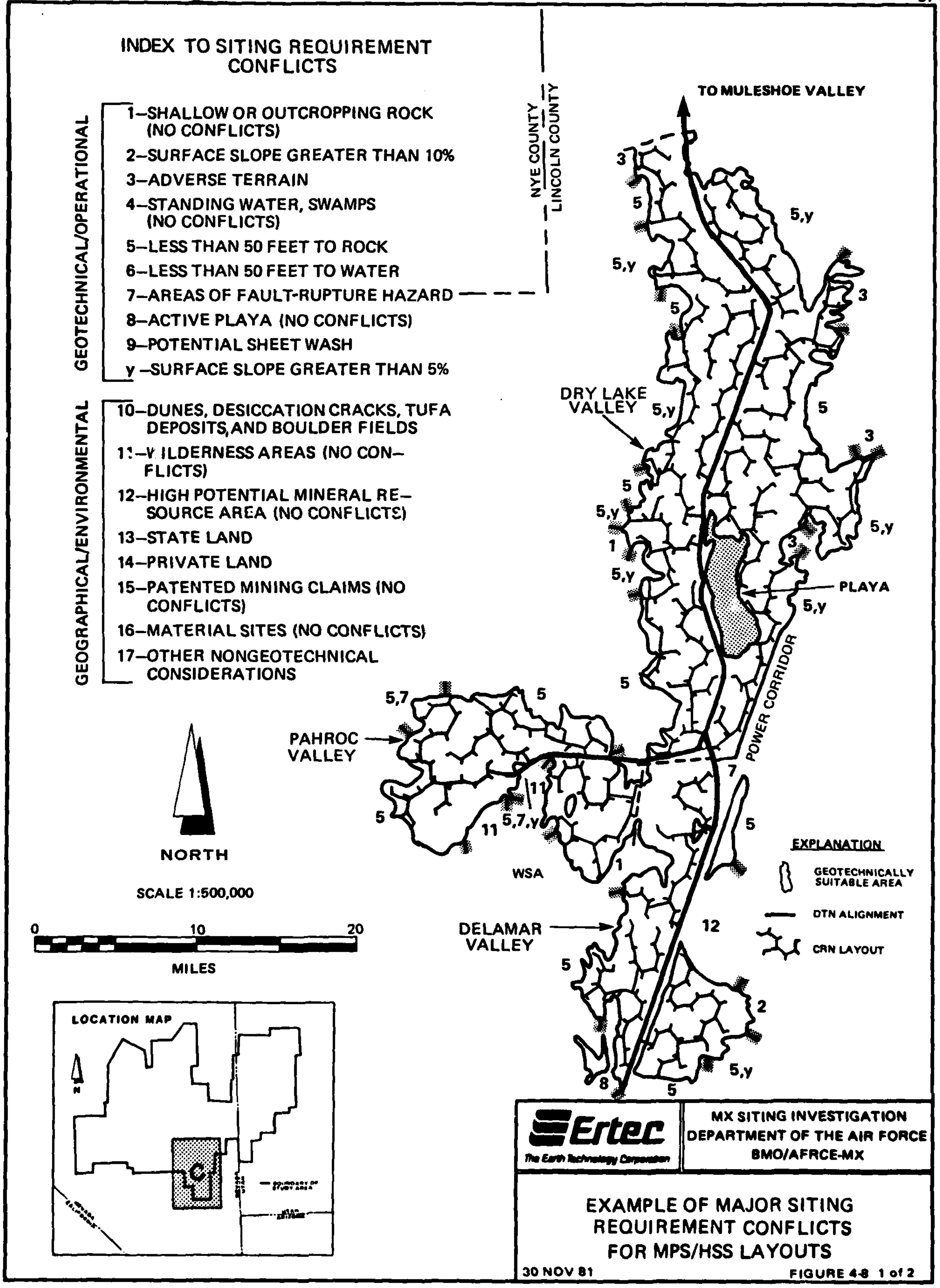
SKETCH MAP G: MPS/HSS LAYOUTS IN NEVADA

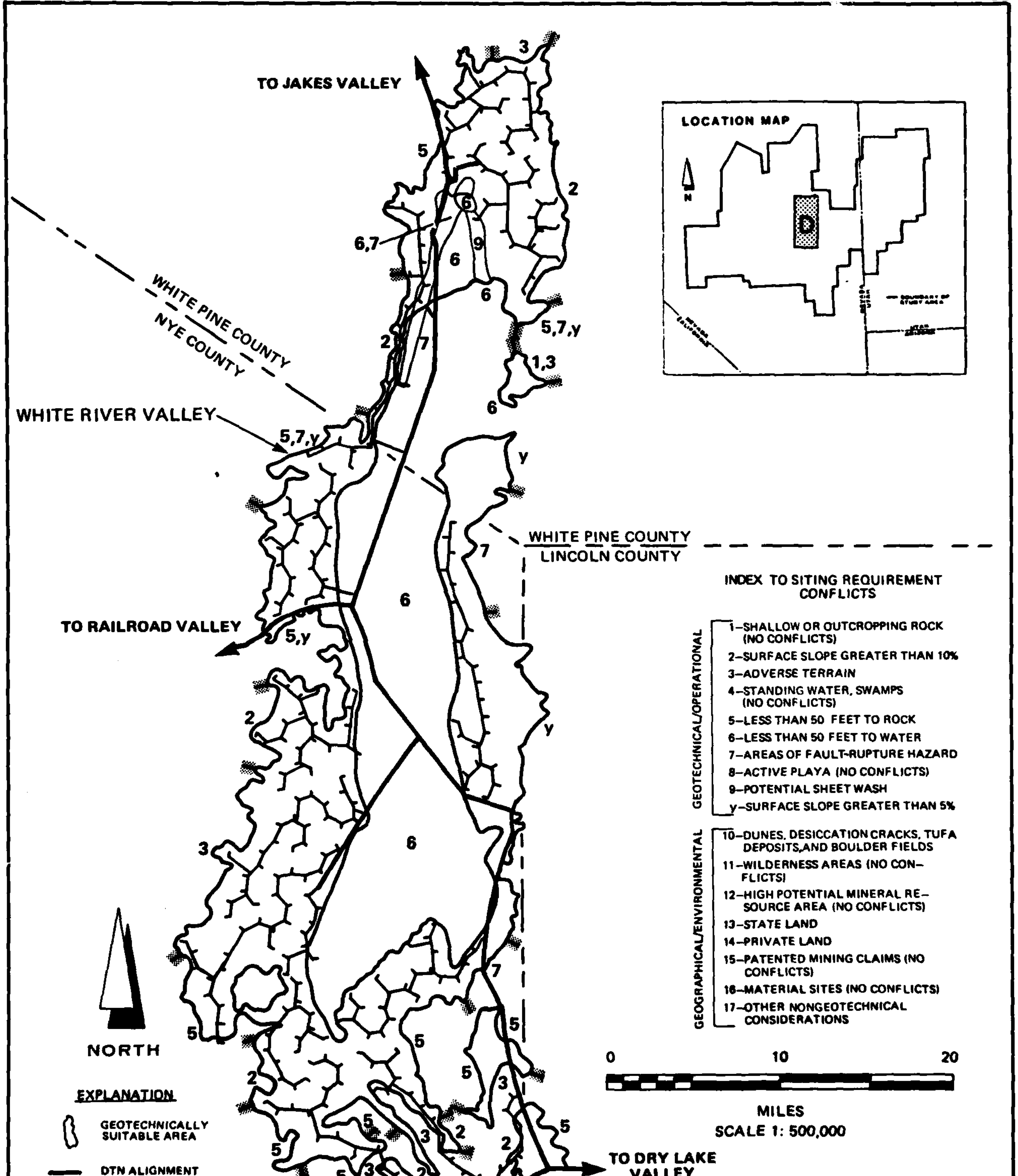
30 NOV 81

FIGURE 4-7G



EXAMPLE OF MAJOR SITING REQUIREMENT CONFLICTS FOR MPS/HSS LAYOUTS

30 NOV 81 FIGURE 4-8 1 of 2



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EXAMPLE OF MAJOR SITING REQUIREMENT CONFLICTS IN MPS/HSS LAYOUTS

30 NOV 81

FIGURE 4-3 2 OF 2

		ADVERSE TERRIAN	SHALLOW WATER	ACTIVE PLAYA	10% SLOPE	MINERAL RESOURCE AREA	WILDERNESS STUDY AREA	RECOM'D COE EXCLUSION
UTAH								
DUGWAY	DW	●	●			●		
FISH SPRINGS FLAT	FS		●			●		
PINE	PI					●		
SEVIER DESERT	SD		●			●		
SEVIER LAKE [2]	SL							
SNAKE	SV		●			●		
TULE	TL			●				
WAH WAH	WA			●		●		
WHIRLWIND	WW		●	●	●			
NEVADA								
ANTELOPE	AN		●			●		
BIG SAND SPRINGS	BG						●	●
BIG SMOKY	BS	●	●	●				
BUTTE	BV			●[1]				
CAVE	CV	●		●	●			●
COAL	CL			●			●	●
DELAMAR	DM					●	●	
DRY LAKE	DL			●	●			
GARDEN	GN		●				●	
HAMLIN	HV	●	●					
HOT CREEK	HC	●	●		●	●	●	
JAKES	JV			●[1]				
KOBEH	KB		●					
LAKE	LV	●	●				●	
LITTLE SMOKY	LS		●					
LONG	LG		●					
MONITOR	MV	●	●					
MULESHOE	MS							
NEWARK	NK	●	●			●		●
PAHROC	PA							
PENOYER	PN		●		●	●	●	
RAILROAD	RR						●	●
RALSTON	RV		●			●		
REVEILLE	RE					●	●	
SPRING	SP		●				●	●
STEPTOE	SO	●	●			●		
STONE CABIN	ST	●				●	●	
WHITE RIVER	WR	●	●					

1 = POTENTIAL STANDING WATER

2 = INCOMPLETE DATA AVAILABLE

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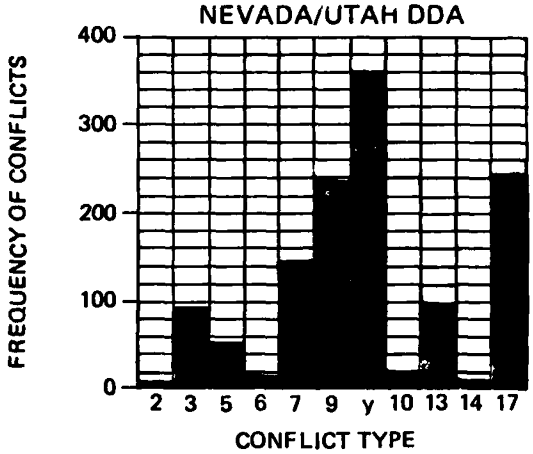
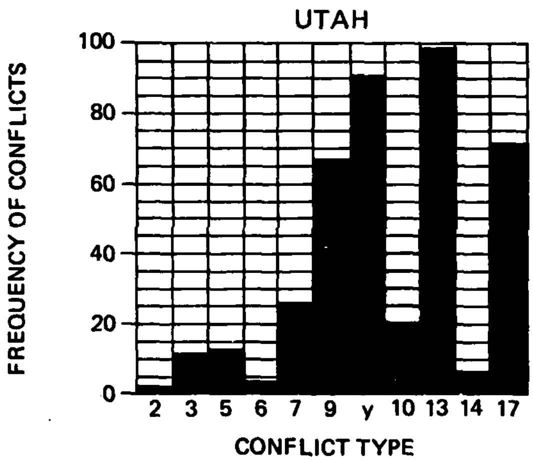
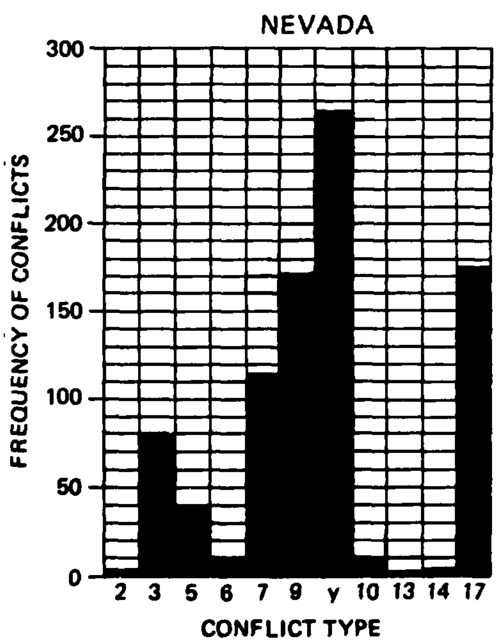
GENERAL SUMMARY OF
MAJOR SITING EXCLUSIONS

30 NOV 81

TABLE 4-6







INDEX TO SITING REQUIREMENT CONFLICTS

GEOTECHNICAL/OPERATIONAL

1–SHALLOW OR OUTCROPPING ROCK (NO CONFLICTS)
2–SURFACE SLOPE GREATER THAN 10%
3–ADVERSE TERRAIN
4–STANDING WATER, SWAMPS (NO CONFLICTS)
5–LESS THAN 50 FEET TO ROCK
6–LESS THAN 50 FEET TO WATER
7–AREAS OF FAULT-RUPTURE HAZARD
8–ACTIVE PLAYA (NO CONFLICTS)
9–POTENTIAL SHEET WASH
y–SURFACE SLOPE GREATER THAN 5%

GEOGRAPHICAL/ENVIRONMENTAL

10–DUNES, DESICCATION CRACKS, TUFA DEPOSITS, AND BOULDER FIELDS
11–WILDERNESS AREAS (NO CONFLICTS)
12–HIGH POTENTIAL MINERAL RESOURCE AREA (NO CONFLICTS)
13–STATE LAND
14–PRIVATE LAND
15–PATENTED MINING CLAIMS (NO CONFLICTS)
16–MATERIAL SITES (NO CONFLICTS)
17–OTHER NONGEOTECHNICAL CONSIDERATIONS

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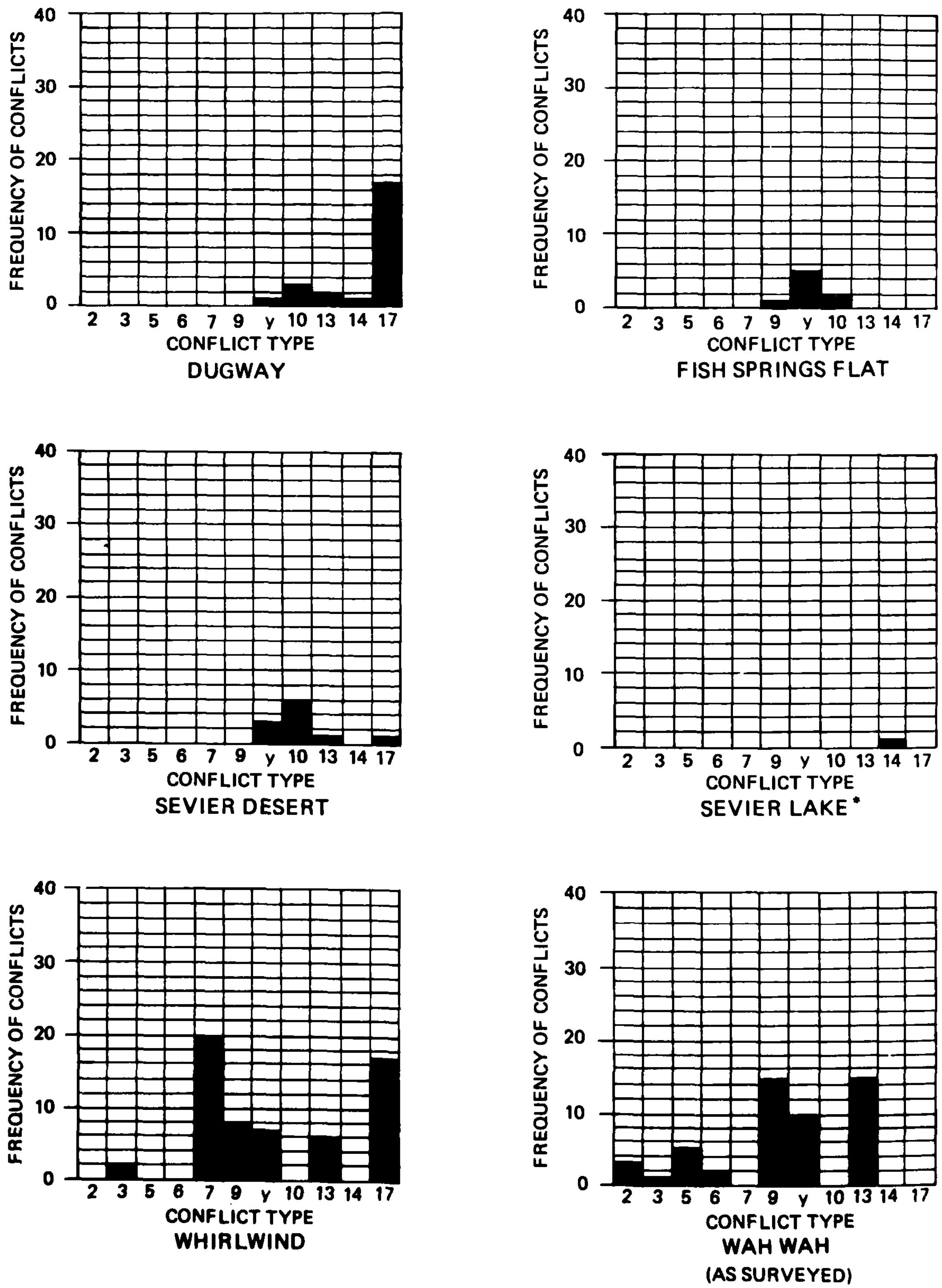
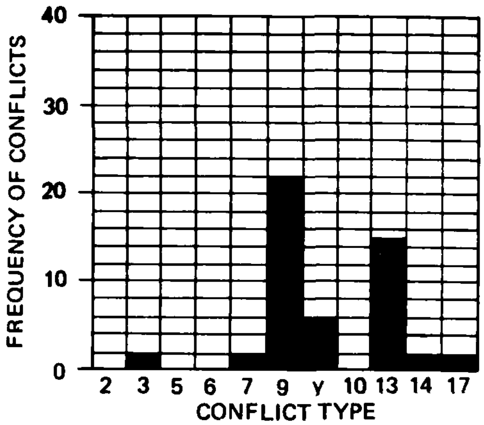
SUMMARY OF SITING REQUIREMENT CONFLICTS

30 NOV 81

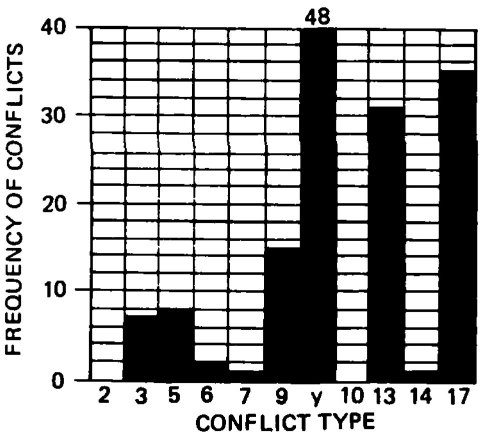
FIGURE 4-9A



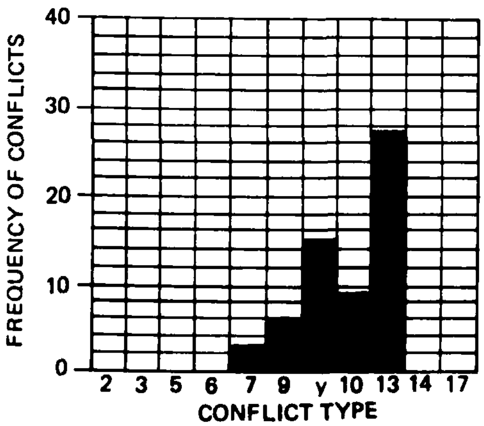
FREQUENCY OF CONFLICTS
0
10
20
30
40
2 3 5 6 7 9 y 10 13 14 17
CONFLICT TYPE
DUGWAY
FISH SPRINGS FLAT
SEVIER DESERT
SEVIER LAKE*
WHIRLWIND
WAH WAH
(AS SURVEYED)



PINE
(AS SURVEYED)



SNAKE



TULE

INDEX TO SITING REQUIREMENT CONFLICTS

GEOTECHNICAL/OPERATIONAL

1–SHALLOW OR OUTCROPPING ROCK (NO CONFLICTS)
2–SURFACE SLOPE GREATER THAN 10%
3–ADVERSE TERRAIN
4–STANDING WATER, SWAMPS (NO CONFLICTS)
5–LESS THAN 50 FEET TO ROCK
6–LESS THAN 50 FEET TO WATER
7–AREAS OF FAULT-RUPTURE HAZARD
8–ACTIVE PLAYA (NO CONFLICTS)
9–POTENTIAL SHEET WASH
y–SURFACE SLOPE GREATER THAN 5%

GEOGRAPHICAL/ENVIRONMENTAL

10–DUNES, DESICCATION CRACKS, TUFA DEPOSITS, AND BOULDER FIELDS
11–WILDERNESS AREAS (NO CONFLICTS)
12–HIGH POTENTIAL MINERAL RESOURCE AREA (NO CONFLICTS)
13–STATE LAND
14–PRIVATE LAND
15–PATENTED MINING CLAIMS (NO CONFLICTS)
16–MATERIAL SITES (NO CONFLICTS)
17–OTHER NONGEOTECHNICAL CONSIDERATIONS

* INCOMPLETE DATA AVAILABLE

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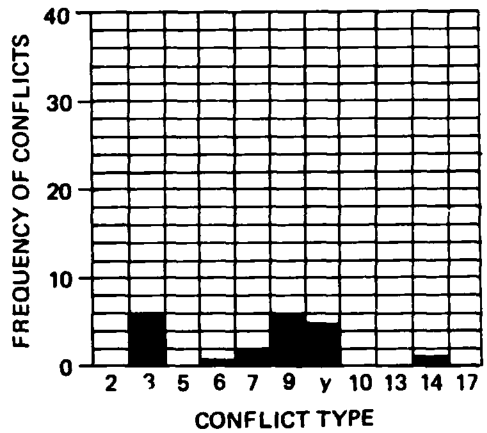
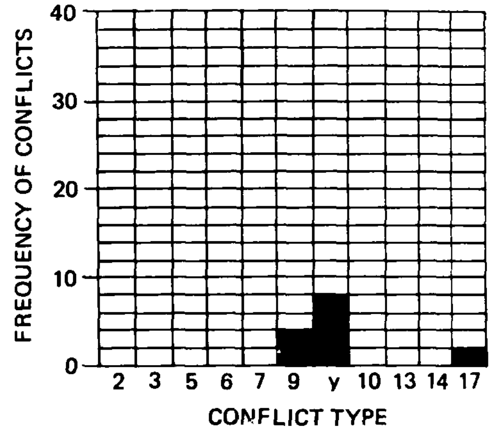
SUMMARY OF SITING REQUIREMENT CONFLICTS FOR UTAH

30 NOV 81

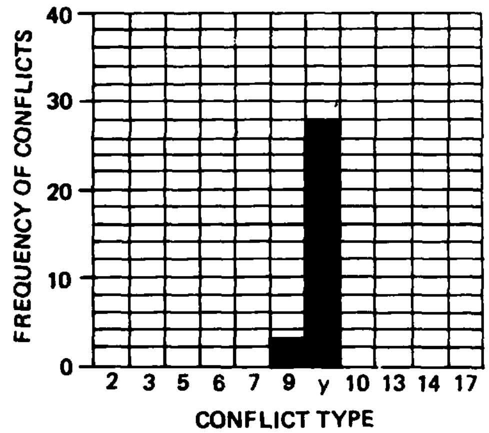
FIGURE 4-98



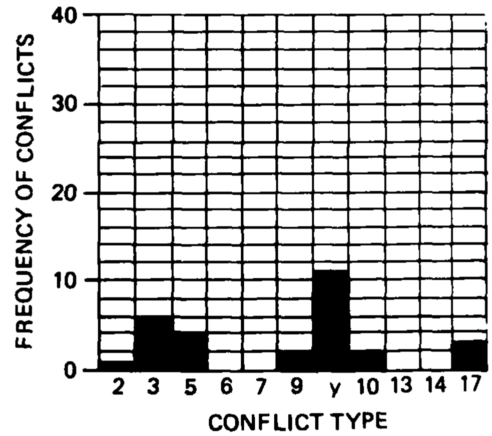
ANTELOPE



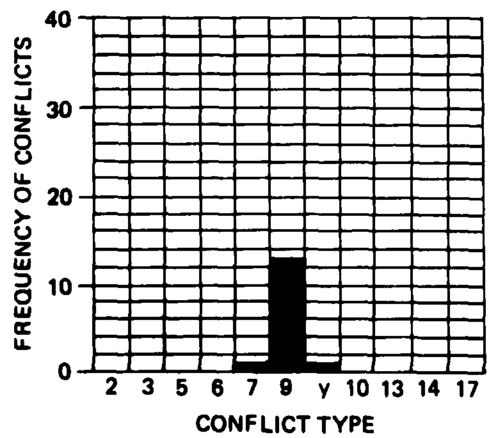
BIG SAND SPRINGS



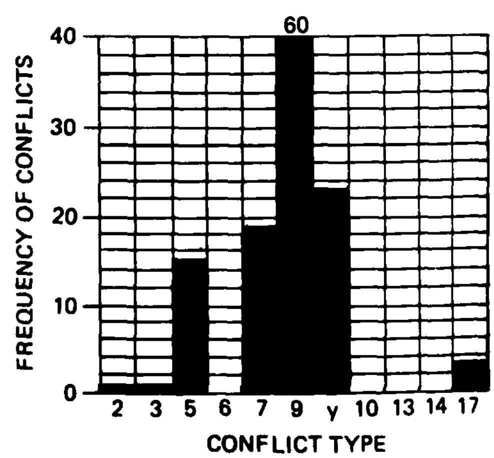
BUTTE



CAVE

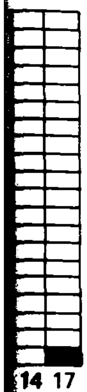


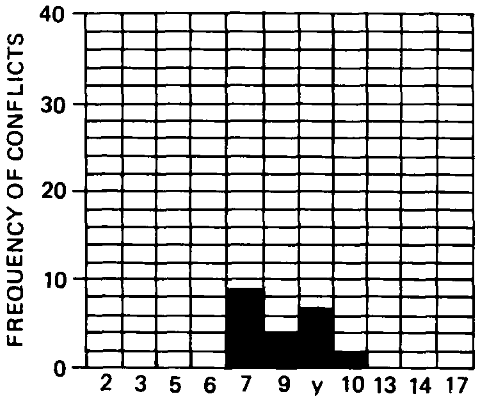
DELAMAR



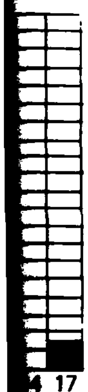
DRY LAKE

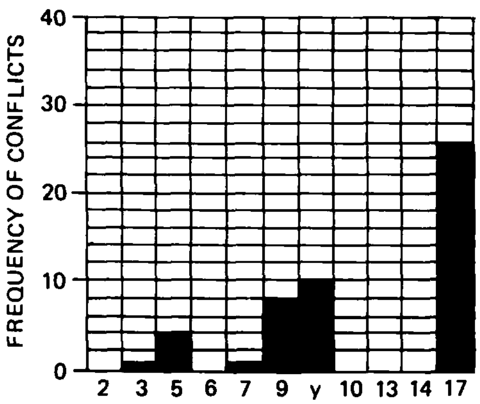
(AS SURVEYED)



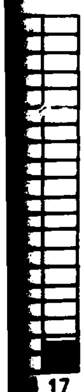


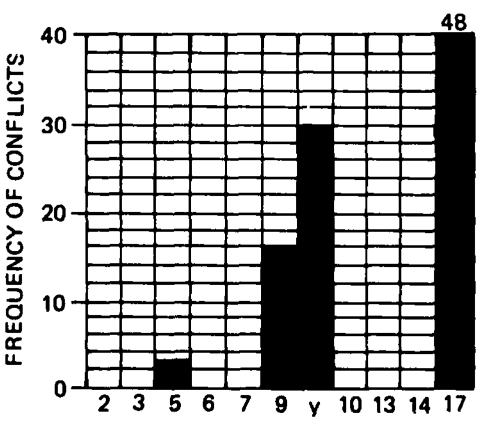
BIG SMOKY





COAL





GARDEN

INDEX TO SITING REQUIREMENT CONFLICTS

GEOTECHNICAL/OPERATIONAL

1–SHALLOW OR OUTCROPPING ROCK (NO CONFLICTS)

2–SURFACE SLOPE GREATER THAN 10%

3–ADVERSE TERRAIN

4–STANDING WATER, SWAMPS (NO CONFLICTS)

5–LESS THAN 50 FEET TO ROCK

6–LESS THAN 50 FEET TO WATER

7–AREAS OF FAULT-RUPTURE HAZARD

8–ACTIVE PLAYA (NO CONFLICTS)

9–POTENTIAL SHEET WASH

y–SURFACE SLOPE GREATER THAN 5%

GEOGRAPHICAL/ENVIRONMENTAL

10–DUNES, DESICCATION CRACKS, TUFA DEPOSITS, AND BOULDER FIELDS

11–WILDERNESS AREAS (NO CONFLICTS)

12–HIGH POTENTIAL MINERAL RESOURCE AREA (NO CONFLICTS)

13–STATE LAND

14–PRIVATE LAND

15–PATENTED MINING CLAIMS (NO CONFLICTS)

16–MATERIAL SITES (NO CONFLICTS)

17–OTHER NONGEOTECHNICAL CONSIDERATIONS

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SUMMARY OF SITING REQUIREMENT CONFLICTS FOR NEVADA

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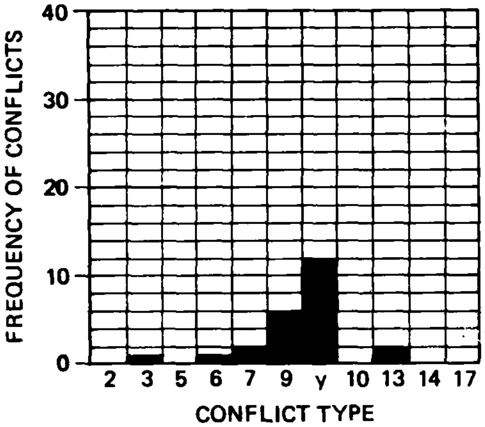
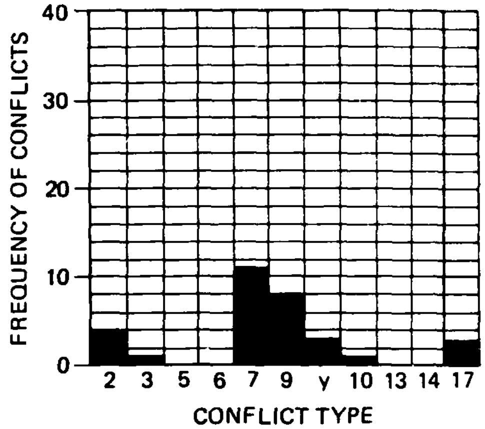
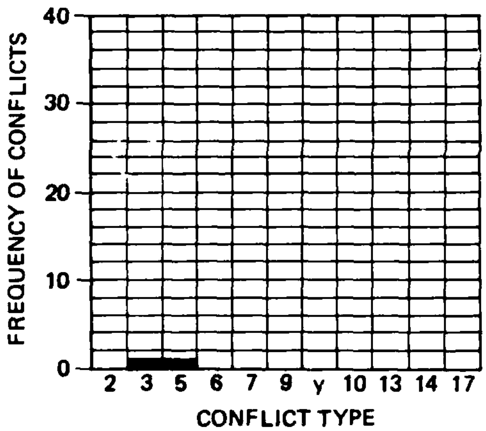
FIGURE 4-9C



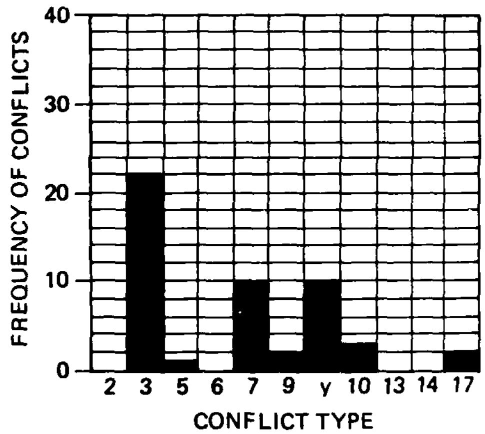
HAMLIN



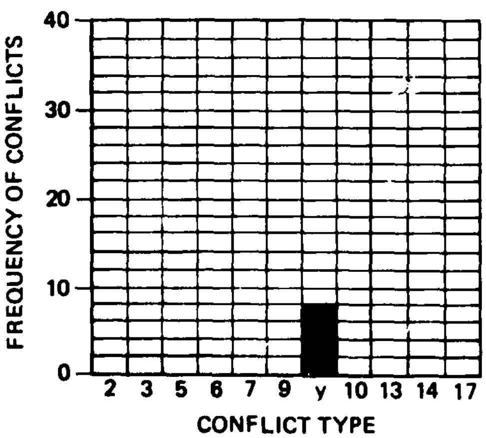
HOT CREEK



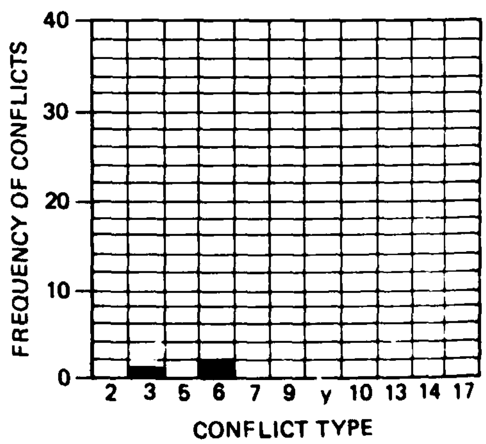
KOBEH



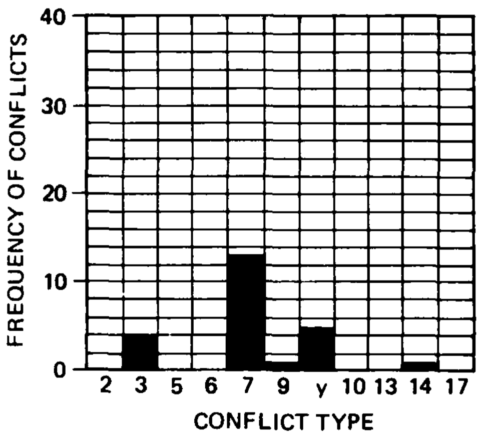
LAKE



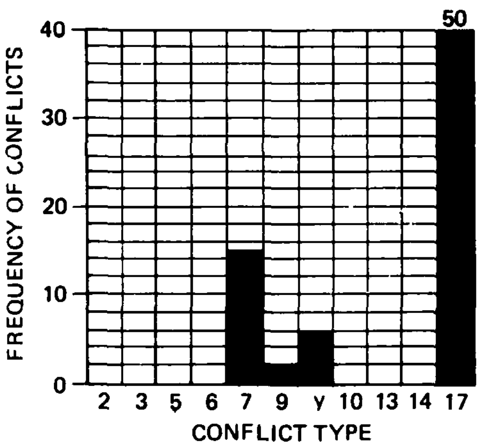
LONG



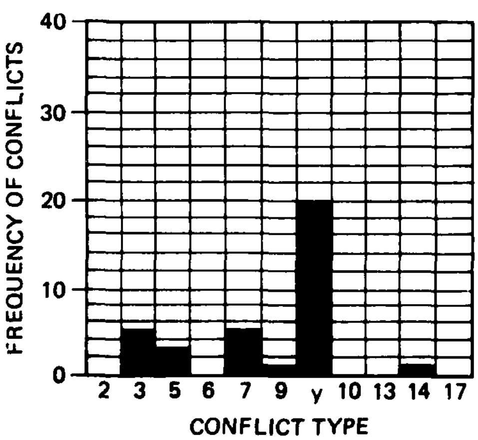
MONITOR



JAKES



LITTLE SMOKY



MULESHOE

INDEX TO SITING REQUIREMENT CONFLICTS

GEOTECHNICAL/OPERATIONAL

1–SHALLOW OR OUTCROPPING ROCK (NO CONFLICTS)

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6–LESS THAN 50 FEET TO WATER

7–AREAS OF FAULT-RUPTURE HAZARD

8–ACTIVE PLAYA (NO CONFLICTS)

9–POTENTIAL SHEET WASH

y–SURFACE SLOPE GREATER THAN 5%

GEOGRAPHICAL/ENVIRONMENTAL

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14–PRIVATE LAND

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16–MATERIAL SITES (NO CONFLICTS)

17–OTHER NONGEOTECHNICAL CONSIDERATIONS

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SUMMARY OF SITING REQUIREMENT CONFLICTS FOR NEVADA

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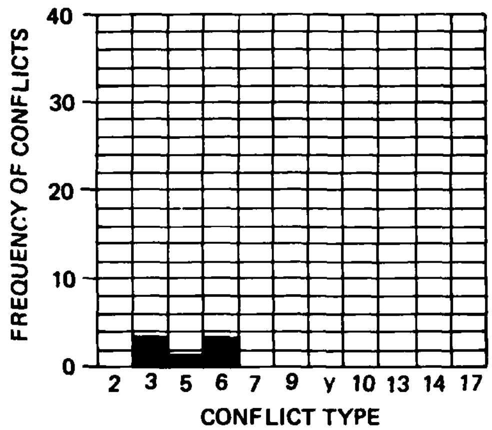
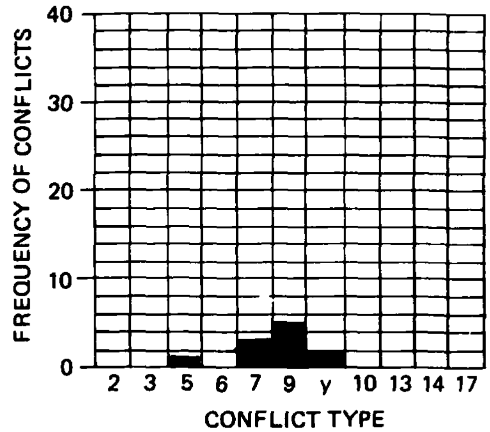
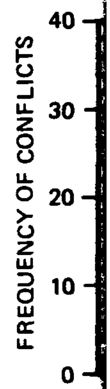
FIGURE 4-9D

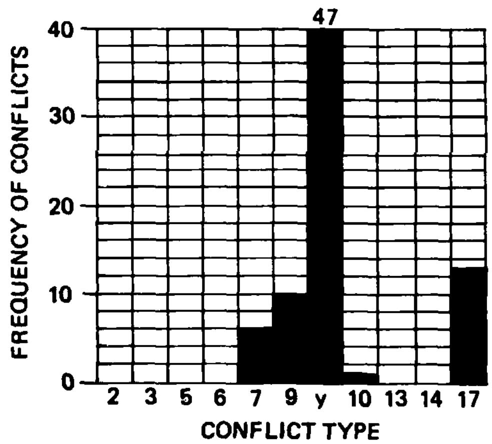


NEWARK

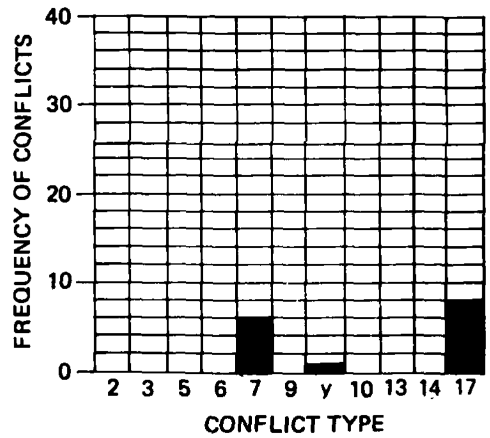


PAHROC

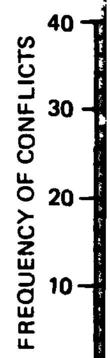


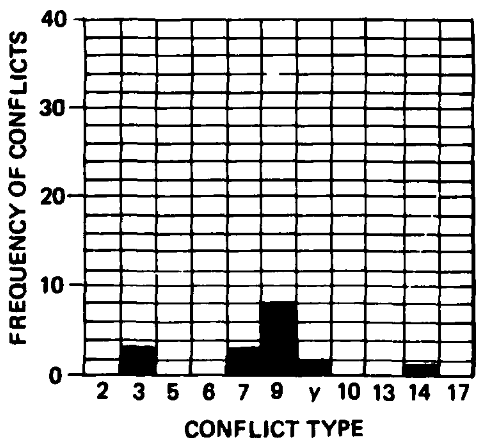


RAILROAD

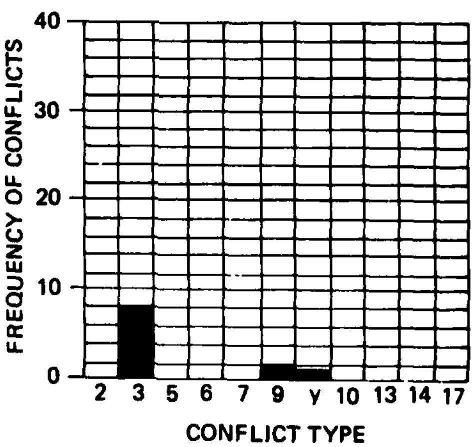


RALSTON

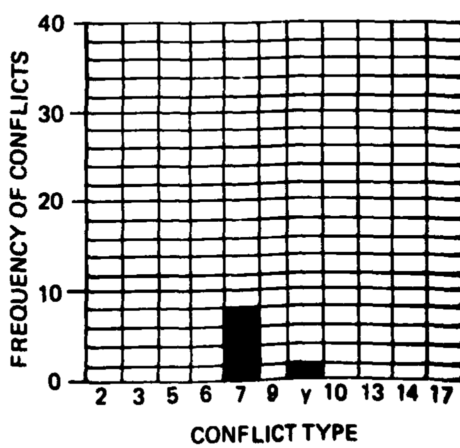




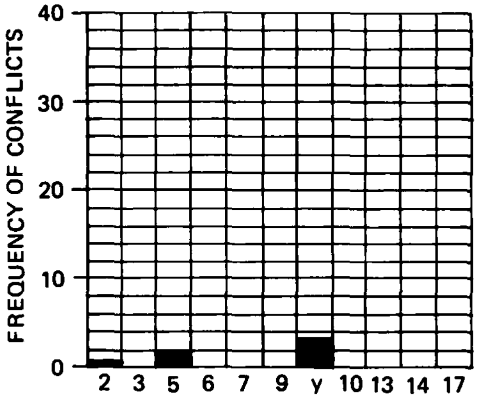
SPRING



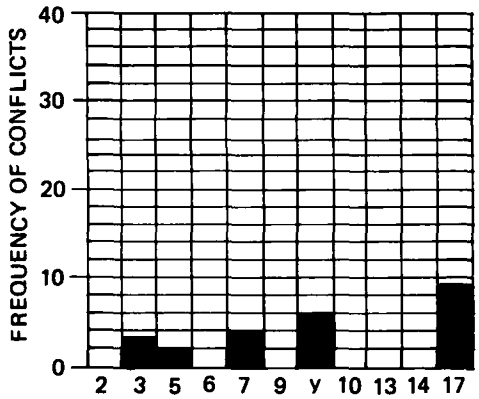
STEPTOE



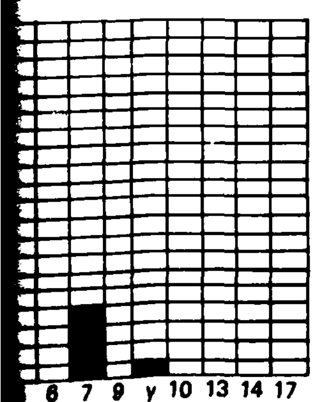
STONE CABIN



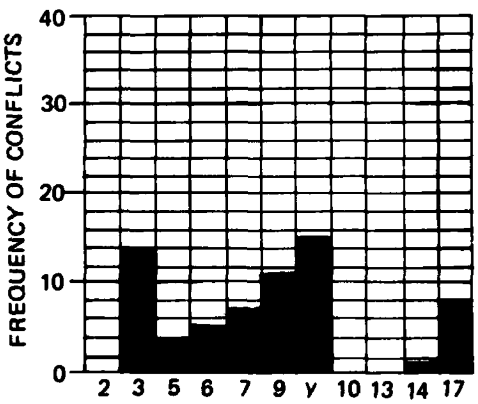
CONFLICT TYPE
PENOYER



CONFLICT TYPE
REVEILLE



CONFLICT TYPE
STONE CABIN



CONFLICT TYPE
WHITE RIVER

INDEX TO SITING REQUIREMENT CONFLICTS

GEOTECHNICAL/OPERATIONAL

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6–LESS THAN 50 FEET TO WATER
7–AREAS OF FAULT-RUPTURE HAZARD
8–ACTIVE PLAYA (NO CONFLICTS)
9–POTENTIAL SHEET WASH
y–SURFACE SLOPE GREATER THAN 5%

GEOGRAPHICAL/ENVIRONMENTAL

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14–PRIVATE LAND
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16–MATERIAL SITES (NO CONFLICTS)
17–OTHER NONGEOTECHNICAL CONSIDERATIONS

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SUMMARY OF SITING REQUIREMENT CONFLICTS FOR NEVADA

30 NOV 81 FIGURE 4-9E

layouts were performed. As an example, all those areas labeled high mineral potential as per the Fugro National, Inc. minerals studies (Fugro National, Inc. 1980b) were removed as suitable area and were not used for siting. Other areas of potential conflicts which were avoided are:

- Shallow or outcropping rock;
- Standing water or swamps;
- Active playas;
- Wilderness and wilderness study areas; and
- Material sites.

When viewed in a system-wide context, the study results also indicate that the most frequent conflicts with siting requirements and their relative percentage of occurrence were shelters sited in areas of:

Areas to be Avoided	Conflict Frequency
o Slopes greater than five percent	14 percent
o Non-geotechnical considerations	10 percent
o Potential sheet wash	8 percent
o State-owned land	8 percent
o Fault-rupture hazard	6 percent

The significance of these occurrences need to be assessed, and would be addressed during the field-survey phase of the siting program.

An evaluation of all the 1:62,500 conceptual layouts delivered to the AFRCE-MX on 15 May 1981 resulted in deleting Steptoe Valley, Nevada, from further siting studies. The DTN length necessary to add these two clusters is excessive. The remaining 1:62,500 layouts resulted in 225 clusters, 12 percent more than the 200 required for the baseline MX system. It was expected that some attrition would occur during the field survey phase of the siting program. If an excess of 200 clusters remained after the field program, it was thought that optimization of the system could be achieved by selectively dropping clusters to accommodate other considerations when reducing the number of clusters to the required 200.

4.2.2 Valley Clustering

Valley clustering was an alternative MPS/HSS basing mode which had an unspecified number of shelters per cluster (i.e., ultimately, all shelters within a valley could be grouped into a cluster). Studies on valley clustering began in June 1981 and were conducted in seven selected valleys in Nevada/Utah DDA, using the prevailing 5200-foot (1585-m) spacing, 2/3-filled hexagonal pattern. A second phase study was directed at a 1.73-mile (2.78-km) spacing, full hexagonal pattern, using Dry Lake Valley as an example. Both studies assumed a Coyote MOB. Since the CMF requirement was not defined, only shelters, CRNs, and DTNs were depicted.

The results of the valley clustering studies in the selected valleys are summarized in Table 4-7. In every case, the valley clustering concept increases the number of shelters in the valley. The increases ranged from eight to 45 shelters. It is difficult to extrapolate the system-wide gains by these general values. However, the trend is toward a more compact system via the concept of valley clustering. Using similar siting

NEVADA	NUMBER OF MPS/HSS 23/1 CLUSTERING 15 MAY 1981	NUMBER OF MPS/HSS VALLEY CLUSTERING 6 JULY 1981	PERCENT CHANGE OF MPS/HSS COUNT USING VALLEY CLUSTERING
DRY LAKE	230	265	+13
HOT CREEK	115	214	+45
LAKE	161	234	+31
MULESHOE	69	75	+8
SPRING	92	101	+9
UTAH			
PINE	138	172	+20
WAH WAH	115	179	+36

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SUMMARY COMPARISON
OF 23/1 CLUSTERING
TQ VALLEY CLUSTERING

30 NOV 81 TABLE 4-7

requirements as the 23/1 clustering, fewer valleys are required for a valley-clustered system.

Phase 2 of the valley-clustering study was to examine the effects of increasing the shelter spacings to 1.73 miles (2.78 km) and using a full hexagonal pattern. These layouts were generated by attempting to utilize as many of the IOC field surveyed MPS/HSSs as possible, reorienting the shelters and adding new locations as necessary. Dry Lake Valley, Nevada, was used as a sample case. The layouts produced are summarized in Table 4-8 which compares shelter counts and CRN and DTN lengths. Options A, B, and C used the 1:62,500 layout of the IOC survey locations, some of which were modified to accommodate BMO/AFRCE-MX siting review comments from the state of Nevada.

Reviewing the statistics for these options reveals that the direct connect CRN reduces CRN length. In all cases, a high proportion of previously surveyed MPS/HSSs could be used, but the total number of shelters is about 50 percent of the shelters available using 23/1 clustering, 5200-foot (1585-m) spacing, 2/3-hexagonal pattern. Minimizing the CRN length was achieved by the reorientation of a large portion of the surveyed shelter sites. Figure 4-10 summarizes the various 1:62,500 layout configurations of MPS/HSS compiled for Dry Lake Valley. The total number of shelters depicted for the valley clustering, 5200-foot (1585-m) spacing layout is less than the 23/1 clustering layouts due to the application of a power

VALLEY CLUSTERING, FULL HEXAGONAL, 1.73 MILE SPACING

OPTION	BASED ON LAYOUT DATED	CRN	ORIGINAL IOC SURVEY SITES USED	ORIGINAL IOC SURVEY SITES USED W/ORIENTATION CHANGE	NEW SITES	TOTAL NUMBER OF SITES	TOTAL CRN LENGTH (SPUR, TRUNK, BARRIER IN MILES)	TOTAL DTN ROAD LENGTH (IN MILES)
A	17 SEP 81	STRAIGHT ROAD	22	68	18	108	227	37.5
B	17 SEP 81	DIRECT CONNECT	16	75	24	115	195.5	37.5
C	17 SEP 81	DIRECT CONNECT	83	13	25	121	212.6	37.2

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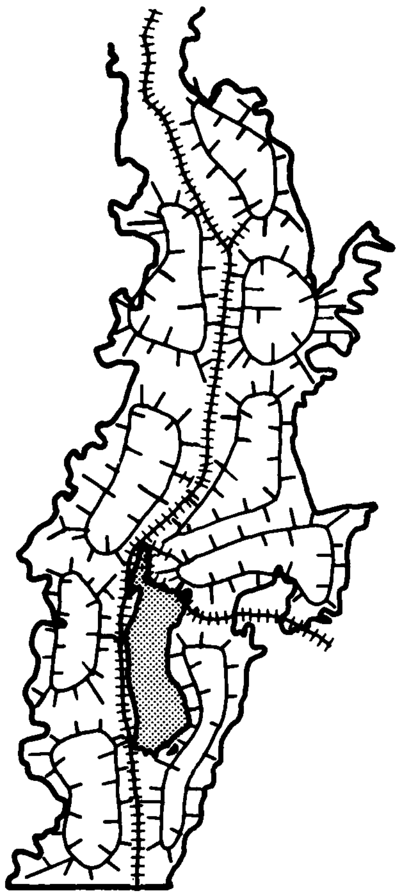
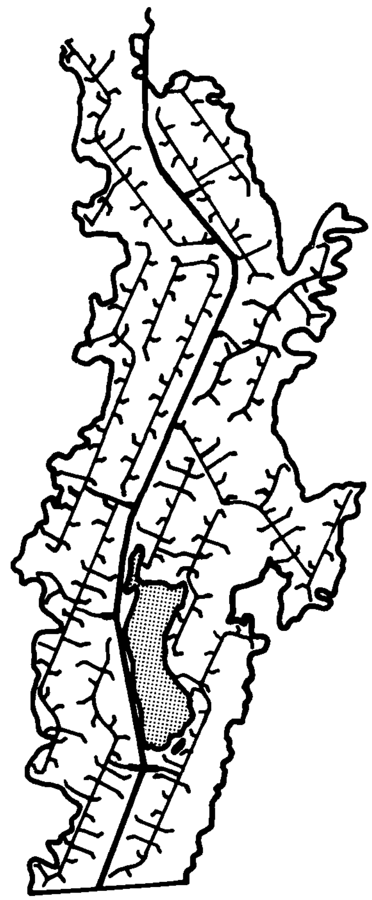
VALLEY CLUSTERING
DRY LAKE VALLEY, NEVADA
1.73-MILE SPACING, FULL HEX
PATTERN DIRECT CONNECT CRN

30 NOV 81

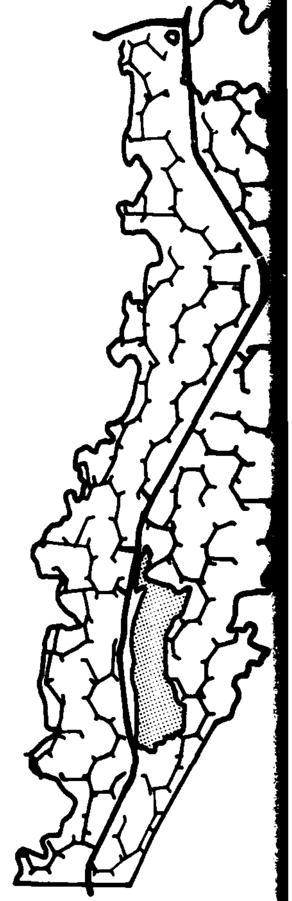
TABLE 4-8



23/1 CLUSTERING, 5200-FOOT SPACING,
2/3 HEXAGONAL PATTERN
LOOP CLUSTER ROAD NETWORK
9 CLUSTERS
207 SHELTERS



23/1 CLUSTERING, 5200-FOOT SPACING,
2/3 HEXAGONAL PATTERN
STRAIGHT TRUNK
CLUSTER ROAD NETWORK
10 CLUSTERS
230 SHELTERS



23/1 CLUSTERING, 5200-FOOT SPACI
2/3 HEXAGONAL PATTERN
DIRECT CONNECT
CLUSTER ROAD NETWORK
10 CLUSTERS
230 SHELTERS

NOTES:

1. ASSUMES COYOTE SPRING MOB
2. CMFs NOT SHOWN
3. THE TOTAL NUMBER OF SHELTERS DEPICTED FOR THE VALLEY CLUSTERING, 5200-FOOT SPACING LAYOUT IS LESS THEN THE 23/1 CLUSTERING LAYOUTS DUE TO THE APPLICATION OF A POWER CORRIDOR EXCLUSION. THIS EXCLUSION WAS NOT APPLIED TO THE OTHER LAYOUTS.

NORTH

)T SPACING,
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T
VORK

VALLEY CLUSTERING, 5200-FOOT SPACING,
2/3 HEXAGONAL PATTERN
DIRECT CONNECT
CLUSTER ROAD NETWORK
2 CLUSTERS
212 SHELTERS

VALLEY CLUSTERING, 1.73-MILE SPACING,
FULL HEXAGONAL PATTERN
DIRECT CONNECT
CLUSTER ROAD NETWORK
2 CLUSTERS
118 SHELTERS

10

LOCATION MAP

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VARIOUS MPS/HSS BASING MODES
IN DRY LAKE VALLEY, NEVADA

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FIGURE 4-10

corridor exclusion. This exclusion was not applied to the other layouts.

4.3 MX SITING REVIEW

The siting review process was conducted in two phases, the technical/operational review (concerned with overall systems compatibility and operational requirements) and the policy/ environmental review (involving federal, state, and local civilian groups).

4.3.1 Technical/Operational Review

Following the compilation of a 1:62,500 layout, the Ertec layout team conducted quality assurance (QA) reviews regarding compliance to the siting requirements. Preliminary prints were prepared for review by AFRCE-MX representatives. The tabulation of quality control data on siting requirement violations and summary of concerns were provided to the reviewers (BMO, AFRCE-MX, and MX systems contractors). The primary functions of this review were to:

- Assure conformance to the siting requirements;
- Provide feedback and updates concerning interpretations of the siting requirements; and
- Provide updates in siting requirements and policies.

Adjustments were made to the layouts in response to review comments. Upon satisfactory completion of this review, additional prints of the layouts were produced and distributed to the participants of the policy/environmental review phases.

4.3.2 Policy/Environmental Review

In the spring of 1981, the AFRCE-MX began a series of meetings designed to involve federal, state, and local groups in the siting review process. The intent was to present the conceptual layouts to these groups and to obtain feedback in terms of siting policy conflicts/deficiencies, additional data not known to exist, and to identify additional concerns from these groups concerning the siting process.

From the onset these meetings had difficulty in achieving the intended goals. Progress seemed to be impeded by a general misunderstanding as to what the conceptual layouts represented. Many of the non-MX affiliated groups perceived the conceptual layouts as final construction plans rather than preliminary drawings. Since for most valleys, the layouts were preliminary and had not been field-checked for environmental and geographical impacts, they contained instances of such impacts which would be corrected in the detailed phase of layout development. These reviews and field reconnaissance were intended to provide the input on which refined layouts would be based.

This misunderstanding was compounded by: 1) the fact that many environmental concerns are non-quantifiable and therefore difficult to map, 2) the concerns of many of the participants were mutually exclusive, and 3) the conceptual layouts were generated using a mechanistic map overlay technique which did not seem to account for the environmental concerns of the reviewers. However, some data exchange took place, and a number of concerns were identified. These comments and concerns were integrated into the valley layouts through the process of avoidance clustering. Avoidance clustering is an attempt to modify a layout to avoid areas of concern. A series of layouts were produced on a valley by valley basis as an attempt to refine the process. The comments were examined, ranked in order of avoidance, and depicted on the overlays by members of the layout team. The nature of the concerns identified did not conform to the application of a uniform standoff.

As an example of this process Figures 4-11 through 4-14 illustrate the sequence of 23/1 layouts which were produced in Pine Valley, Utah, in response to the review comments. Figure 4-11 depicts the 1:62,500 layout of Pine Valley prior to coordination meetings with the state of Utah. Superimposed on this layout are some of the environmental concerns of the state: water holes, raptor nests, white sage, and sage grouse. The layout infringes upon all of these areas (the circles are 1/2-mile [.8-km] radii around water holes and raptor nests).

The state recommended that a 1 mile (1.6 km) radius standoff be imposed upon all raptor nests and water holes. Figure 4-12 illustrates that this standoff imposes some severe constraints on siting the clusters by having several CRN links cross major drainage features. Another layout avoided the areas of white sage and applied a 1/2-mile (.8-km) radius standoff distance to all raptor nests and water holes where possible. The resulting layout is shown in Figure 4-13. This layout also has several

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UNCLASSIFIED E-TR-58-VOL-1 NL

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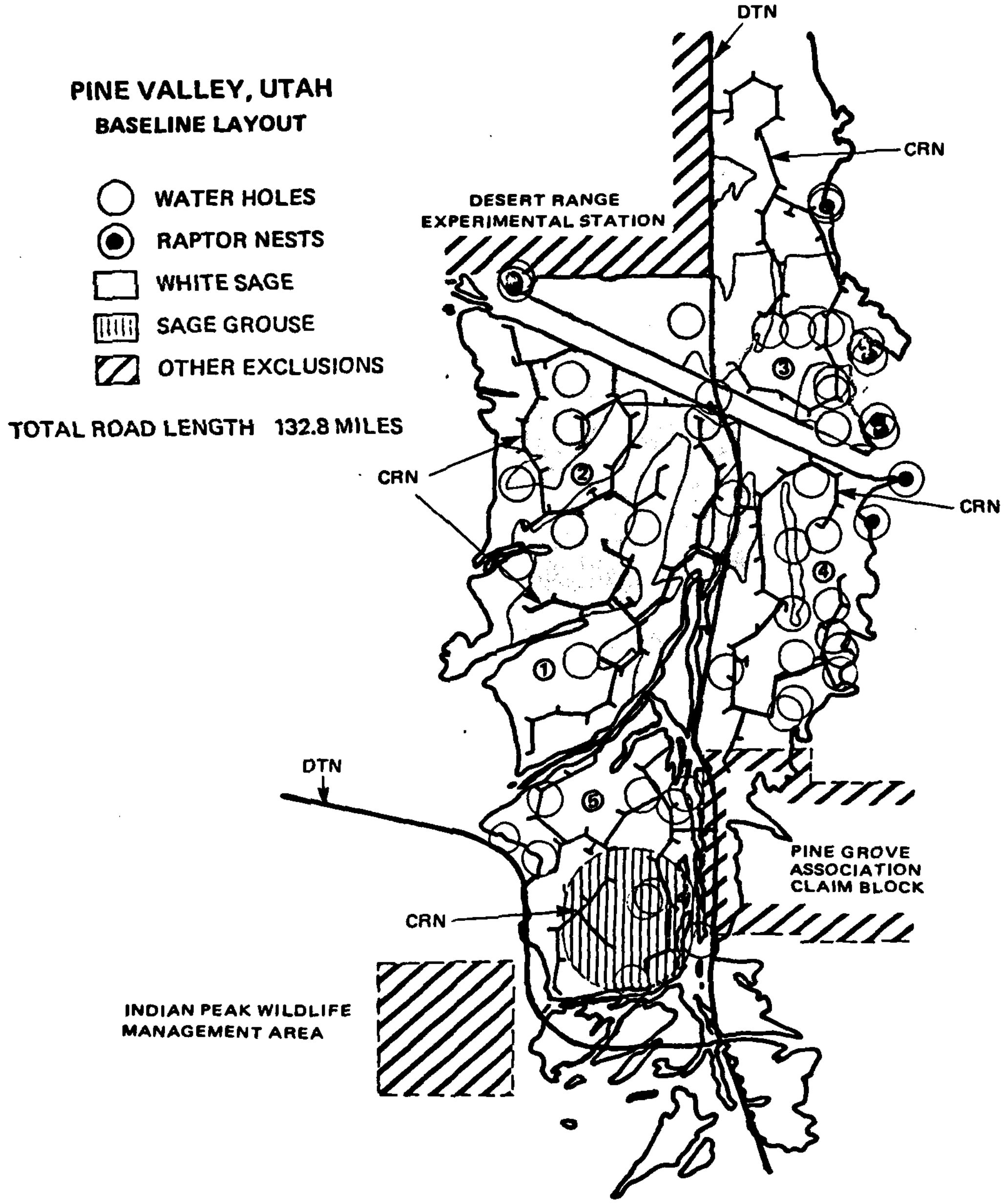

DTN = DESIGNATED TRANSPORTATION NETWORK ROAD
CRN = CLUSTER ROAD NETWORK

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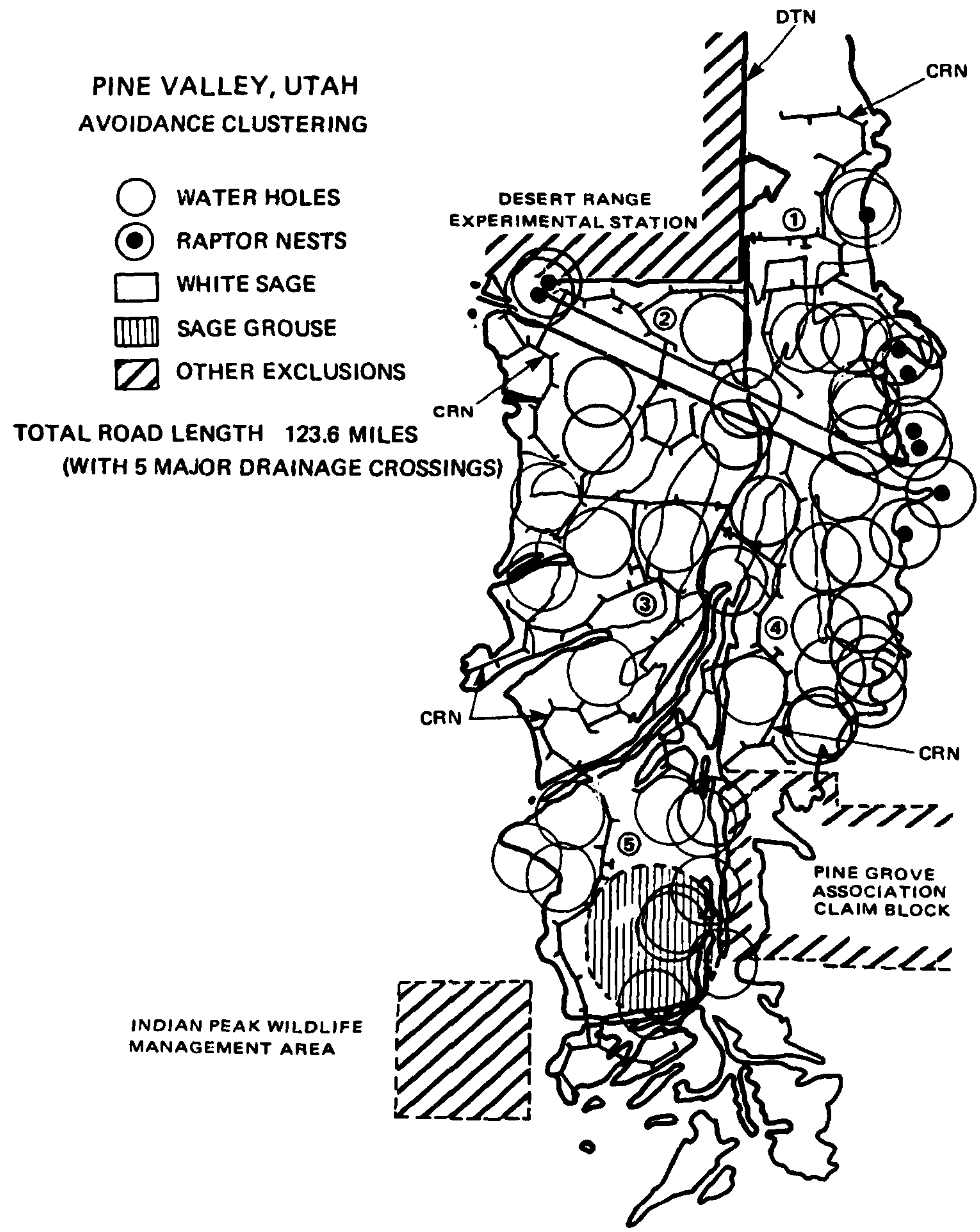
PINE VALLEY, UTAH
BASELINE MPS LAYOUT

30 NOV 81

FIGURE 4-11



DTN — DESIGNATED TRANSPORTATION NETWORK ROAD

CRN — CLUSTER ROAD NETWORK

NOTE:
CANNOT BE USED AS AN IOC VALLEY SINCE THERE IS NO ACCESS FROM THE SOUTH.

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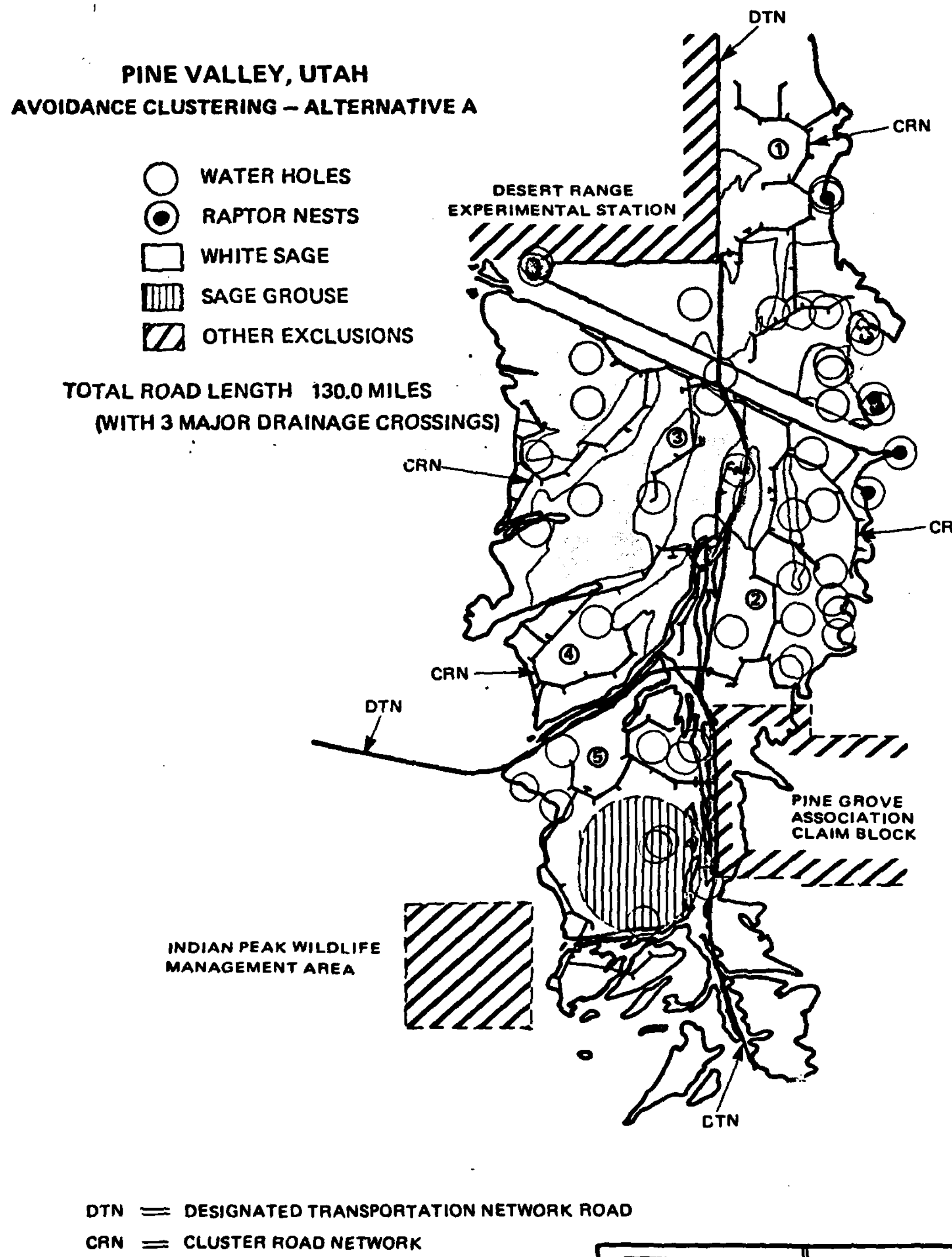
PINE VALLEY, UTAH
ENVIRONMENTAL CONSIDERATIONS,
1 MILE STANDOFF

30 NOV 81 — FIGURE 4-12



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PINE VALLEY, UTAH
ENVIRONMENTAL CONSIDERATIONS,
½ MILE STANDOFF
ALTERNATIVE A

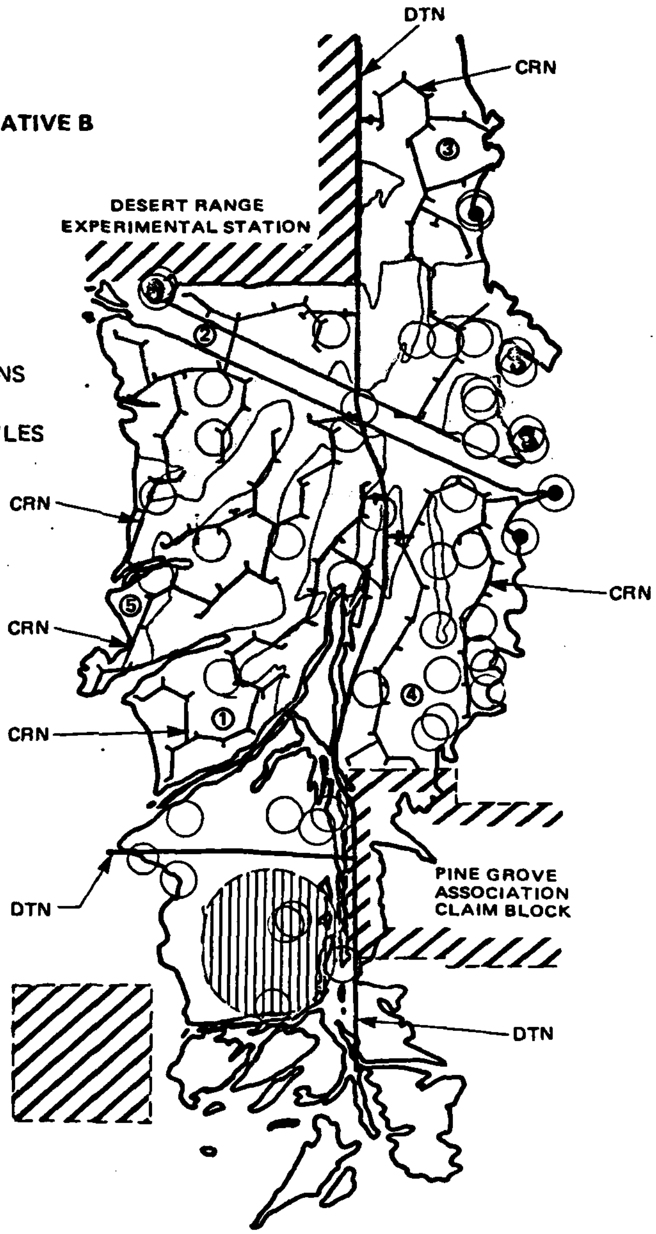
30 NOV 81

FIGURE 4-13

PINE VALLEY, UTAH
AVOIDANCE CLUSTERING – ALTERNATIVE B

- WATER HOLES
- RAPTOR NESTS
- WHITE SAGE
- SAGE GROUSE
- OTHER EXCLUSIONS

TOTAL ROAD LENGTH 133.4 MILES
(WITH NO MAJOR DRAINAGE CROSSINGS)



DTN = DESIGNATED TRANSPORTATION NETWORK ROAD
CRN = CLUSTER ROAD NETWORK

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PINE VALLEY, UTAH
ENVIRONMENTAL CONSIDERATIONS,
½ MILE STANDOFF
ALTERNATIVE B

30 NOV 81 FIGURE 4-14

CRN links crossing major drainage features. Figure 4-14 depicts the resulting layout compromise which successfully avoids the drainage crossings, water holes, sage grouse, and raptor nests. However, the layout does encroach upon the white sage areas. This particular layout was presented in the land acquisition application package.

During the policy/environmental review, questions were raised by the Utah MX Coordinating Office regarding proposed shelter sitings in Snake Valley and the proposed Area Support Center (ASC) location in Tule Valley. This provided an opportunity to evaluate the ongoing conceptual siting activities against the actual conditions in the valleys. An overflight reconnaissance and a ground tour were conducted in these valleys. The letter from the Utah MX Coordinating Office and the final trip report are included in Appendix H. The trip helped to show that the siting methodology at the Tier 1 level (1:62,500 scale layouts) worked well. Had the siting process continued, field verification of the layouts at this scale would have taken place.

The policy/environmental review proved to be a useful process. The conceptual layout was a model of the proposed action and served as a focal point for discussions. This spatial model provided a foundation to build upon, serving as a vehicle to incorporate the concerns of the reviewers in a holistic context. The net result was an appreciation for other points of view and compromises as appropriate.

4.4 DETAILED VALLEY LAYOUTS AT 1:9600

Following the siting review process, an approved 1:62,500 conceptual layout was graphically transferred to a 1:9600 topographic base map. The 1:9600 transfer process enabled further refinement of the layout due to the increased topographic detail at a larger map scale. Some shelter sites were shifted after the transfer to avoid drainages which could be identified on the larger scale topographic maps. Land parcel descriptions of the facility sites were also based on these more-detailed maps.

Changes in MPS/HSS due to the transfer process were checked against the siting data map overlays. Completion of the transfer was followed by digitizing the 1:9600 layout to perform mathematical checks on shelter spacings and orientations. Deviations were corrected prior to generating the cadastral survey coordinates using the appropriate state plane coordinate system. A revised 1:62,500 layout was produced as an index to the 1:9600 map sheets for the IOC valleys. The index sheet, a set of 1:9600 maps, and computer printouts of the survey coordinates were delivered to Ertec Airborne, the cadastral survey coordinator. Refer to Section 3.0 for samples of maps and computer printouts of survey data. The layout for Dry Lake Valley, Nevada, and Pine and Wah Wah valleys, Utah, were completed 8 September 1980, 25 November 1980, and 8 January 1981, respectively.

The land parcel descriptions were based on the land net shown on the 1:9600 maps. The descriptions were referenced to the

U.S. Public Land Survey System. However, the cadastral data accompanying the land parcel descriptions are based upon calculation and/or compilation from record and are not the result of a retracement survey.

4.5 FIELD SITING SURVEYS/IOC

The primary objectives of the field surveys were to:

- Identify problems associated with siting criteria or layout procedures by actually locating MPS/HSSs, CMFs, and RSSs in the field;
- Assess environmental and geotechnical conditions at the MPS/HSSs, CMFs, and RSSs and along a few road corridors and determine what changes are needed to minimize impacts;
- Develop a methodology for performing field surveys in the DDA; and
- Provide land parcel descriptions of surveyed sites for the land acquisition application.

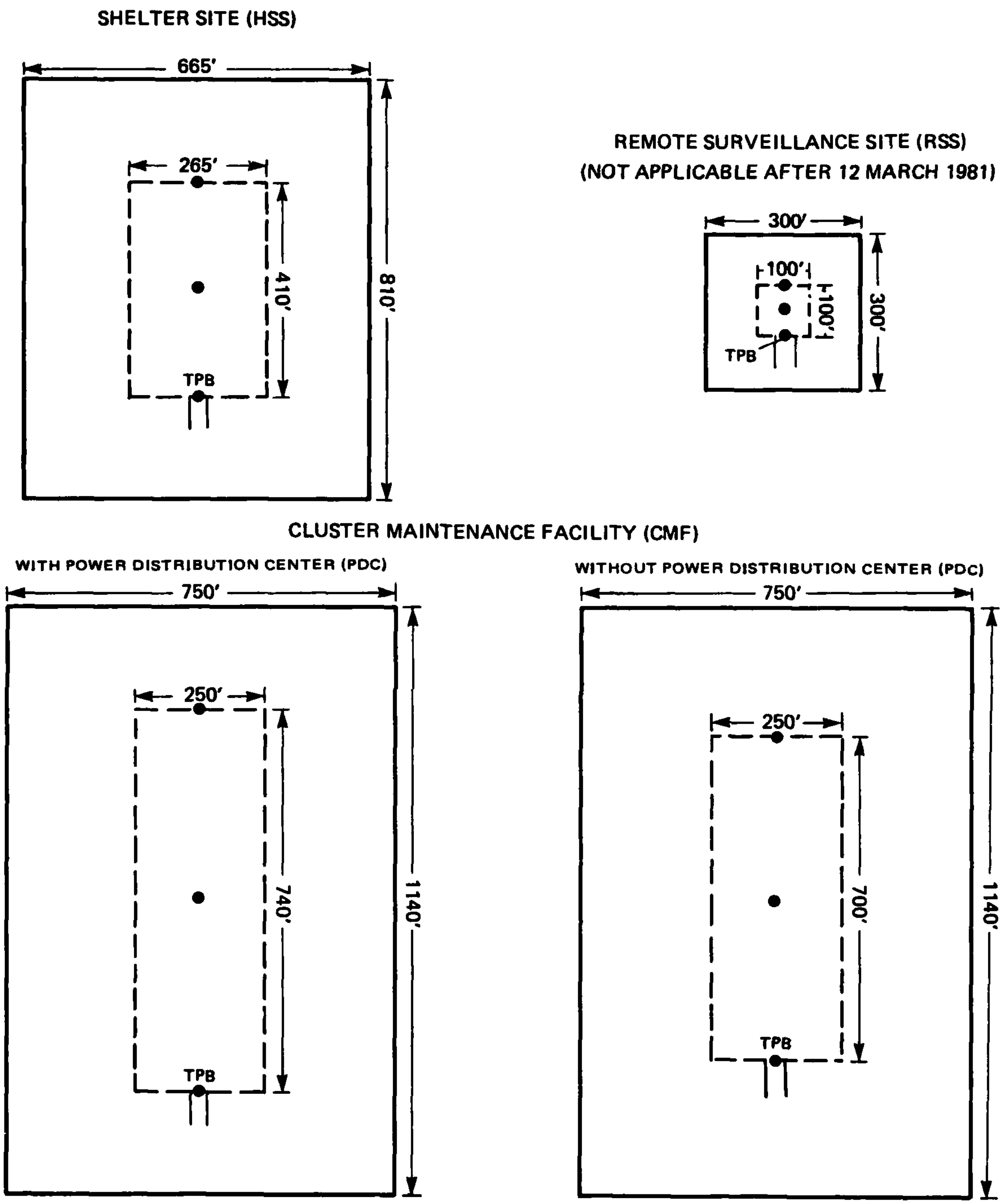
The field surveys were a continued refinement of the overall siting process and moved the conceptual layout from the drawing board to the real world. The net effect was that previously unquantifiable considerations could be observed and noted. Thus, the map studies were updated by first-hand observations.

The field surveys consisted of locating and monumenting each MPS/HSS, CMF, and RSS in the IOC valleys and the centerline of the DTN and Cluster 2 roads in Dry Lake Valley, Nevada. Geotechnical inspections of all sites were necessary to verify location within suitable area and to evaluate site-specific geotechnical and terrain conditions. Sites were recommended for relocation when necessary. A team of archaeologists and biologists also inspected the sites for cultural resources and environmental factors in the site area and estimate construction zone. Figure 4-15 shows the delineation of the environmental clearance zones surrounding the sites. At sites where sensitive or threatened and endangered plant and wildlife species existed or where cultural resources were considered significant, the sites were recommended for relocation and alternate sites were identified. Recommendations were submitted to the AFRCE-MX for field and office review.

After final decisions had been made regarding the sites to be relocated, the layouts were revised and new survey coordinates were generated. The sites were surveyed and monumented and the environmental surveys were conducted. The final steps were the preparation of land parcel descriptions of each site to be acquired and the preparation of an environmental and general report of the program. A summary table of the relocated sites in the IOC program is presented in Table 4-9. The field surveys for Dry Lake Valley, Nevada, and Pine and Wah Wah valleys, Utah, were completed in December 1980 and March and April 1981, respectively (Ertec, 1981a through e).

4.6 LAND ACQUISITION APPLICATION

The shelter siting portion of the first increment in the land acquisition application consists of the IOC valley facilities and associated DTN layout options. These options were transferred to the "E" format 1:62,500 scale topographic base maps. Drawing 3-3 is a sample "E" format 1:62,500 map sheet.



SCALE 1 INCH = 300 FT

EXPLANATION

● MONUMENT

TPB TRUE POINT OF BEGINNING

═ ROAD

– – – LAND THAT WILL BE WITHDRAWN FROM PUBLIC USE

—— BOUNDARY OF ENVIRONMENTAL SURVEY AREA

THE HSS SCHEMATIC SHOWN HERE IS BASED ON THE BASELINE CONCEPT IN EFFECT AT THE TIME OF THE IOC FIELD SURVEYS

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SCHEMATIC OF SURVEYED SITES
FOR THE IOC FIELD SURVEYS

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FIGURE 4-15

	NEVADA	UTAH	
	Dry Lake Valley	Pine Valley	Wah Wah Valley
Number of Clusters	10	5	5
Number of Shelters	230	115	115
Number of CMFs	10	5	5
Number of RSSs	5	4	4
DTN	39 miles (62 km)	0	0
Cluster 2 Roads	30 miles (48 km)	0	0

	NEVADA		UTAH					
	Dry Lake Valley		Pine Valley		Wah Wah Valley		Total IOC Valleys	
	Number	Percent*	Number	Percent*	Number	Percent*	Number	Percent*
Archeological	3	13	1	4.5	2	8	6	8
Biological	0	0	1	4.5	0	0	1	1
Geotechnical:								
Fault	2	9	1	4.5	0	0	3	4
Bedrock	1	4	0	0	1	4	2	3
Earth cracks	2	9	0	0	0	0	2	3
Wash in front of shelter	3	13	4	18	4	15	11	15
Wash affecting shelter	6	26	4	18	7	27	17	24
Wash at rear of shelter	1	4	6	27	2	8	9	13
Playa	0	0	1	4.5	0	0	1	1
Cultural	0	0	3	14	0	0	3	4
Criteria	5	22	1	4.5	10	38	16	23
Totals	23		22		26		71	

* NOTE:
THE PERCENT IS IN RELATION TO THE TOTAL NUMBER OF SITES RESITED IN THE VALLEY(S)

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SUMMARY OF SURVEYED AND RELOCATED SITES, IOC FIELD SURVEYS

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TABLE 4-9

The first increment consisted of 17 base map sheets and a regional map (1:500,000) showing the system layout. The IOC valleys are presented on seven sheets. A complete list of attachments of the initial increment is in Table 4-10. The IOC valley has been depicted for each of the candidate MOB options. The options were as follows:

- o Coyote Spring MOB, Dry Lake Valley - IOC;
- o Beryl MOB, Pine and Wah Wah valleys -IOC; and
- o Milford MOB, Pine and Wah Wah valleys - IOC.

By depicting both IOC valley options, the application could be assembled in a timely manner once the decision makers had selected the final MOB/IOC valley combination. Also depicted is the connecting DTN for each of the Nevada and Utah IOC valleys. The regional map was produced to present the remaining facilities and alignments in the system.

Land parcel descriptions for the IOC valley facilities were produced and accompanied the drawings. The descriptions were referenced to the U.S. Public Land Survey. The IOC valley facilities were described by tying the surveyed location of the monument (at the intersection of the front fence with the center line of the facility) to the nearest U.S. Public Land Survey section corner (Figure 4-16). Table 4-11 represents an example of the parcel descriptions format used. It shows one cluster per page except when the cluster does not lie totally in one state plane zone. If the cluster crosses the zone boundary, one page for each zone is then given. Bearings are given

Attachment*		Sheet No.*
5-00	Regional Map UT/NV (1:500,000)	
5-01	Explanation Sheet	A
5-02	Option A-Coyote Spring/Description	
5-03	Option A-Coyote Spring/Map (1:62500)	29
5-04	Option B-Coyote Spring/Description	
5-05	Option B-Coyote Spring/Map (1:62500)	29
5-06	Option C-Coyote Spring/Description	
5-07	Option C-Coyote Spring/Map (1:62500)	29
5-08	Option D-Coyote Spring/Description	
5-09	Option D-Coyote Spring/Map (1:62500)	29
5-10	Option E-Milford/Description	
5-11	Option E-Milford/Map (1:62500)	47
5-12	Option E-Milford/Map (1:62500)	56
5-13	Option F-Milford/Description	
5-14	Option F-Milford/Map (1:62500)	47
5-15	Option F-Milford/Map (1:62500)	56
5-16	Option G-Milford/Description	
5-17	Option G-Milford/Map (1:62500)	47
5-18	Option G-Milford/Map (1:62500)	56
5-19	Option H-Milford/Description	
5-20	Option H-Milford/Map (1:62500)	47
5-21	Option H-Milford/Map (1:62500)	56
5-22	Option I-Beryl/Description	
5-23	Option I-Beryl/Map (1:62500)	47
5-24	Option I-Beryl/Map (1:62500)	48
5-25	Option J-Beryl/Description	
5-26	Option J-Beryl/Map (1:62500)	47
5-27	Option J-Beryl/Map (1:62500)	48
5-28	Option K-Beryl/Description	
5-29	Option K-Beryl/Map (1:62500)	47
5-30	Option K-Beryl/Map (1:62500)	48
5-31	Option L-Beryl/Description	
5-32	Option L-Beryl/Map (1:62500)	47
5-33	Option L-Beryl/Map (1:62500)	48
5-34	Dry Lake Valley Description	
5-35	Dry Lake Valley Map (1:62500)	26
5-36	Dry Lake Valley Map (1:62500)	27
5-37	Dry Lake Valley Map (1:62500)	37
5-38	Dry Lake Valley Map (1:62500)	38
5-39	Pine/Wah Wah Valleys/Description	
5-40	Pine/Wah Wah Valleys/Map (1:62500)	45
5-41	Pine/Wah Wah Valleys/Map (1:62500)	46
5-42	Pine/Wah Wah Valleys/Map (1:62500)	54
5-43	DTN fm Coyote OB to Dry Lake Valley/Map (1:62500)	28
5-44	RR fm Mainline to Coyote OB/Map (1:62500)	30
5-45	Powerline fm Power Plant to MOB/Map (1:62500)	41
5-46	Powerline fm Sigurd Substation to MOB/Map (1:62500)	55
5-47	Powerline fm Sigurd Substation to MOB/Map (1:62500)	61
5-48	Powerline fm Sigurd Substation to MOB/Map (1:62500)	62

*THE ITEMS LISTED ARE ATTACHMENTS TO SECTION 5 OF THE LAND ACQUISITION APPLICATION TO BE PREPARED BY THE AFRCE-MX

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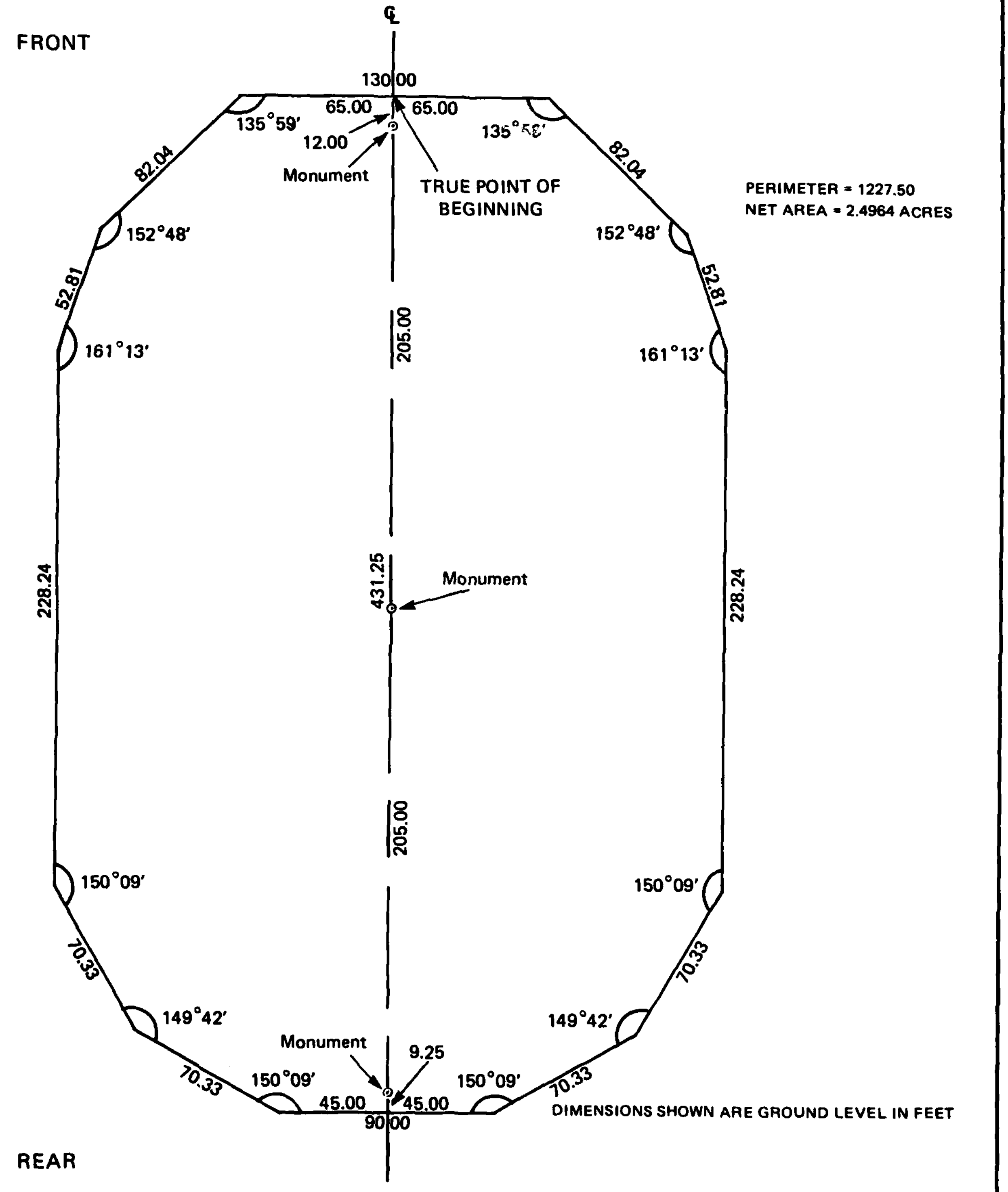
LIST OF ATTACHMENTS FOR
LAND ACQUISITION APPLICATION
PACKAGE NEVADA/UTAH

30 NOV 81 TABLE 4-10



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SHAPE AND DIMENSIONS OF HSS
FOR LAND PARCEL DESCRIPTIONS

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FIGURE 4-16

MX SITING PROJECT
DRY LAKE VALLEY, NEVADA
CLUSTER 4

Being 23 parcels in the County of Lincoln, State of Nevada, each having the shape and dimensions as shown on FIGURE 4-16, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	2S	64E	NE23	S 66° 12' W	1020	N 82° 10' E
2	2S	64E	NW14	S 47° 39' E	2161	S 85° 00' W
3	2S	64E	NE11	S 27° 20' W	2751	N 37° 31' W
4	2S	64E	NE12	S 36° 24' W	2470	S 38° 13' E
5	2S	65E	NW 6	S 15° 38' E	2462	N 81° 07' E
6	1S	64E	NE33	S 9° 20' E	959	N 38° 32' W
7	1S	64E	NE34	S 78° 26' W	217	S 37° 20' E
8	1S	64E	SE35	N 64° 05' W	2479	S 22° 05' W
9	1S	64E	SE36	N 54° 08' W	3110	S 38° 31' E
10	1S	64E	NE21	S 29° 05' W	2747	N 35° 55' W
11	1S	64E	NW26	S 70° 18' E	1949	N 81° 04' E
12	1S	64E	SE25	N 23° 04' W	1304	N 83° 05' E
13	1S	64E	NE22	S 2° 01' W	1896	N 20° 22' E
14	1S	64E	SW24	N 89° 51' E	2082	S 83° 09' W
15	1S	65E	SE30	N 17° 25' W	1994	S 36° 11' E
16	1S	64E	NE14	S 61° 07' W	5268	N 81° 06' E
17	1S	64E	NE24	S 59° 38' W	1346	N 37° 07' W
18	1S	64E	SE10	N 49° 41' W	2590	S 82° 21' W
19	1S	64E	NW13	S 29° 12' E	1864	S 38° 13' E
20	1S	65E	SE18	N 84° 06' W	1612	S 36° 18' E
21	1S	64E	SE 3	N 0° 49' W	1159	N 37° 44' W
22	1S	64E	NE12	S 47° 14' W	2708	N 80° 00' E
23						

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Nevada State Plane Coordinate System, Grid North, East Zone.
Distances shown are ground level in feet.

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SAMPLE LAND PARCEL DESCRIPTION
DRY LAKE VALLEY, NEVADA

30 NOV 81

TABLE 4-11

relative to state plane grid north. Distances shown are ground level in feet without corrections for terrain. Monuments were recovered for about one percent of the section corners used. It is not the intent of these descriptions to establish or imply that section corners are in existence or are known to be in existence or that they should be located as indicated on the accompanying "E" sized, 1:62,500 scale maps.

5.0 SHELTER SITING PROGRAM SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The overall siting program was a success. The integrated multi-disciplinary groups within Ertec developed the necessary siting data, produced the conceptual layouts, provided documentation sources to support tiering, and produced the initial increment of the land acquisition application. A general overview of the siting program summary and conclusions will be followed by some recommendations for improving the siting program.

5.1 SHELTER SITING PROGRAM SUMMARY

The goals of Ertec's siting programs were to:

- Develop conceptual layouts;
- Support the tiering process; and
- Support the land acquisition process.

At the end of FY 81, Ertec had successfully accomplished these goals. In FY 82, had the tiering and land acquisition processes continued for the rest of the system, the siting program would have continued to provide a functional and able effort to support the MX system. A summary of the shelter siting program in the Nevada/Utah DDA is presented below.

5.1.1 Conceptual Layouts

Conceptual MPS/HSS layouts have been generated for the 37 valleys in the Nevada/Utah DDA at a scale of 1:62,500. The various clustering configurations are listed in Table 5-1. The

		CONCEPTUAL LAYOUT			
		1:62,500			
		23/1 CLUSTERING			
		5200-FOOT SPACING			
		2/3 FILLED HEXAGONAL PATTERN			
		LOOP CRN	LINEAR CRN		
			STRAIGHT TRUNK	DIRECT CONNECT	
UTAH		FY 80	FY 80 & 81	FY 81	
1. DUGWAY	DW		●	●	
2. FISH SPRINGS FLAT	FS		●	●	
3. PINE	PI		●	●	●
4. SEVIER DESERT	SD		●	●	
5. SEVIER LAKE	SL		●	●	
6. SNAKE	SV	●	●	●	
7. TULE	TL	●	●	●	
8. WAH WAH	WA		●	●	●
9. WHIRLWIND	WW	●	●	●	
UT SUBTOTAL		3	9	9	2
NEVADA					
1. ANTELOPE	AN		●	●	
2. BIG SAND SPRINGS	BG		●	●	
3. BIG SMOKY	BS	●		●	
4. BUTTE	BV			●	
5. CAVE	CV	●	●	●	
6. COAL	CL		●	●	
7. DELAMAR	DM	●	●	●	
8. DRY LAKE	DL	●		●	●
9. GARDEN	GN		●	●	
10. HAMLIN	HV	●	●	●	
11. HOT CREEK	HC	●	●	●	●
12. JAKES	JV			●	
13. KOBEH	KB			●	
14. LAKE	LV		●	●	●
15. LITTLE SMOKY	LS	●		●	
16. LONG	LG			●	
17. MONITOR	MV		●	●	
18. MULESHOE	MS	●	●	●	●
19. NEWARK	NK			●	
20. PAHROC	PA	●	●	●	
21. PENOYER	PN		●	●	
22. RAILROAD	RR		●	●	
23. RALSTON	RV	●	●	●	
24. REVEILLE	RE		●	●	
25. SPRING	SP		●	●	●
26. STEPTOE	SO			●	
27. STONE CABIN	ST	●	●	●	
28. WHITE RIVER	WR		●	●	
NV SUBTOTAL		11	19	28	5
TOTAL		14	28	37	7

LAYOUT			TIERING SUPPORT			
	VALLEY CLUSTERING		BMO/AFRCE—MX SITING REVIEW		CONCEPTUAL LAYOUT	'E' FORMAT 1:62,500 LAND ACQUISITION APPLICATION
TERN		1.73-MILE SPACING FULL HEX PATTERN	SUBMISSION OF 1:62,500 LAYOUTS FOR REVIEW	RECEIVED SITING REVIEW COMMENTS	1:9600 LAYOUT AND FIELD SITING SURVEY	
EAR CRN						
DIRECT CONNECT						
FY 81						
			●			
			●			
	●		●	●	●	●
			●			
			●			
			●			
			●	●		
	●		●	●	●	●
			●			
	2	0	9	3	2	2
			●			
			●			
			●			
			●			
			●	●		
			●			
			●	●		
	●	●	●	●	●	●
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			●			
			●			
			●			
			●			
	●		●	●		
			●			
			●			
			●			
	5	1	28	8	1	1
	7	1	37	11	3	3

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SUMMARY STATUS OF THE SHELTER LAYOUT PROGRAM

30 NOV 81

TABLE 5-1

latest delivery to the AFRCE-MX consisted of a series of 37 drawings at a scale of 1:62,500 employing 23/1 clustering, 5200-foot (1585-m) spacing, a 2/3-filled hexagonal pattern, and a direct connect CRN. This delivery was made on 15 May 1981. Subsequent conceptual layout work involved studies in valley clustering at 1:62,500 scale and presented the IOC valleys in the land acquisition application.

5.1.2 Tiering Process and State Review

Tiering process support consisted of providing the conceptual layouts and siting documentation to the various reviewers via the AFRCE-MX. Table 5-2 summarizes the schedule for state and agency review of the 15 May 1981 layouts. The actual generation of the DOPAAs for the IOC valley sitings and other follow-on valleys was scheduled to begin in FY 82. Ertec siting personnel attended siting coordination meetings with the AFRCE-MX. These meetings were held in the states of Nevada and Utah. Follow-on technical working level meetings were conducted with the states at Ertec's Long Beach office. The results of these meetings helped to clarify and resolve some of the mitigation concerns involved in the siting process. For the IOC valleys, the layouts were modified as a result of the state review process and the modified layouts of the IOC valleys were incorporated in the land acquisition application.

5.1.3 Land Acquisition Application

In support of the land acquisition application, Ertec coordinated the development and production of a land acquisition

	VALLEY/STATE	AFRCE-MX RELEASE DATE	PROPOSED STATE COMMENTS DUE DATE
REVIEW INCREMENT ONE	CAVE, NV	15 JUNE	30 JUNE
	DELAMAR, NV		
	DRY LAKE, NV		
	HAMLIN, NV		
	LAKE, NV		
	MULESHOE, NV		
	PAHROC, NV		
	SPRING, NV		
	PINE, UT		
	TULE, UT		
	WAH WAH, UT		
REVIEW INCREMENT TWO	BIG SAND SPRING, NV	6 JULY	31 JULY
	COAL, NV		
	GARDEN, NV		
	HOT CREEK, NV		
	LITTLE SMOKY, NV		
	PENOYER, NV		
	RAILROAD, NV		
	REVEILLE, NV		
	STONE CABIN, NV		
	WHITE RIVER, NV		
	SEVIER DESERT, UT		
	SNAKE, UT		
REVIEW INCREMENT THREE	WHIRLWIND, UT	3 AUGUST	31 AUGUST
	ANTELOPE, NV		
	BIG SMOKY, NV		
	BUTTE, NV		
	JAKES, NV		
	KOBEH, NV		
	LONG, NV		
	MONITOR, NV		
	NEWARK, NV		
	RALSTON, NV		
	STEPTOE, NV		
	DUGWAY, UT		
	FISH SPRING FLAT, UT		
	SEVIER LAKE, UT		

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AFRCE-MX RELEASE DATES
MAY 15, 1981
MPS/HSS LAYOUTS

30 NOV 81 TABLE 5-2

package. The land acquisition application package consisted of the following elements:

- o A regional map at a scale 1:500,000 showing the 37 valley system with the area clustered, the connecting DTN, the ASC sites and giving the cluster counts for each valley;
- o Base maps at a scale of 1:62,500 depicting not only the IOC valley facilities but the other MOB and OBTS/DTA site options with associated right-of-way alignments; and
- o Land parcel descriptions of all facilities (legal descriptions) depicted at 1:62,500.

The detailed depictions and parcel descriptions of the remaining system depicted on the regional map were to be provided in later increments.

The initial increment of the package containing the regional and the 1:62,500 "E" size map sheets with land parcel descriptions was delivered to the AFRCE-MX on 17 September 1981. The parcel descriptions of the IOC valley facilities are presented in Appendix G. After AFRCE-MX review, revisions were made and a second delivery of the map sheets occurred on 2 October 1981. The revised map sheets are presented in Volume III.

5.2 CONCLUSIONS

The results of the MPS/HSS siting program demonstrated that the MX system could be spatially accommodated within the Nevada/ Utah DDA. The 1:62,500 scale conceptual layouts of these valleys provided a baseline for:

- o Evaluating the areal extent of a 200 cluster system;
- o Evaluating the impact on the resources of specific valleys; and
- o Evaluating alternative MPS/HSS basing scenarios.

The conceptual layouts using 23/1 clustering, 5200-foot (1585-m) spacing, 2/3-filled hexagonal pattern, direct connect CRN produced 12 percent more clusters than the required 200. This provided an acceptable buffer against anticipated attrition during the design and construction phases.

In terms of evaluating the effectivness of the MPS/HSS siting methodology, the IOC field survey results indicated that only 14 percent of the 493 facilities sited required relocation from the original sites determined by the conceptual layouts. The siting process seemed to be a viable mechanism for siting the MX system. The siting procedures were also shown to be flexible by readily adapting to new basing modes and by producing various revisions in response to siting review comments. The application of computer techniques to generate spacing and orientation checks of the layouts was useful and produced ready reference data for the technical reviews. Generating the cadastral survey coordinates from these data proved timely and cost effective. The response time of the layout team was rapid and greatly aided the IOC field survey program schedule which was constricted by time and weather.

5.3 RECOMMENDATIONS ON METHODOLOGY

While the siting program did achieve its initial goals, no program is free from flaws or limitations. The reality of any siting program is that decisions have to be made based upon the best available information at the time. The following observations are made in the spirit of improving the general siting process.

5.3.1 Computer Applications

The increasing number of siting factors, the complexity of their relationships and the various combinations and weights which can be assigned to the siting considerations to be examined in optimizing a given layout, calls for the serious consideration of applied computer graphics. The use of this technology is not a panacea, for it possesses the need for high degrees of quality control and validation. The difficulty lies in synthesizing the proper systems software (e.g., data management systems) and applications software (e.g., geographic information system) to solve the siting problem. The net result would be a system capable of utilizing data at various scales and from various sources and which could adjust the data in a consistent fashion onto a common base map series for ready comparison. Thus, computer applications could provide more rapid response to the myriad of siting questions which invariably arise during the planning and siting phases of any project, particularly one as large as MX.

5.3.2 Coordination, Communication, and Data Exchange

A program as large as MX creates some management problems which are generally not experienced on smaller projects. A large number of tasks have to be performed by many different contractors under the guidance of many different project offices. Many of the tasks are interrelated and coordination, communication, and data exchange are essential. Significant improvements were made in this area, particularly in the latter part of FY 81 when data exchange meetings were initiated. These meetings provided an avenue for finding out what other contractors were doing, what data they had which would be useful to their own study, and set schedules for dispersing of data. One limitation was that not all contracts had provisions for covering the cost of producing additional copies of data and reports for other contractors.

In the future, it is recommended that data exchange and coordination meetings be initiated at the beginning of a project between environmental, geotechnical, and siting contractors. Also, there should be "special studies" funds or other contractual arrangements which cover costs for data exchange.

5.3.3 Scale Problems

Many of the contractors used topographic maps to present plans and layouts of their work. Because the level of detail varied for each task, different scales of maps were needed. However, some efficiencies could have resulted if two or three standard scales had been selected early in the program so that each contractor used one of the standard scales. Since most maps required the splicing together of several base maps, there could be some cost savings if one contractor is responsible for producing the required base maps and sending negatives of these maps to other contractors who need them. Such a plan is generally not necessary for a small project, however, when dealing with several thousands of square miles, the cost of producing maps becomes quite significant.

5.3.4 Mitigation Measures

In producing the conceptual layouts, there were exclusionary criteria and avoidance criteria (considerations). Application of exclusionary criteria was fairly straight forward except in those cases where there was not sufficient data to properly define exclusionary limits. The application of avoidance criteria or considerations to the layouts was a much more difficult problem, particularly with regard to environmental issues, because of the difficulty of weighing the various factors. A typical example was in Pine Valley where it was possible to meet all the exclusionary criteria but where it was difficult to assess the relative importance of the considerations. Which was more important - water holes, white sage, sage grose strutting grounds, or mining operations?

The Air Force is responsible for preparing a mitigation plan and this task was in progress at the time the conceptual layouts were being produced. Working groups were evaluating the mitigation measures identified in the Draft Environmental Impact Statement (DEIS) as well as taking into consideration public comments and public hearings. Also, siting coordination meetings were initiated in May 1981, to receive input from the states, BLM, Native American groups, and other interested parties. These meetings provided a means of reviewing siting conflicts and identifying appropriate mitigation measures.

It would be advantageous in future programs to initiate mitigation plans and siting coordination meetings as early as possible and to involve the citizens and local governments in the siting process. Input from these sources would be used to assist in the formulation of mitigation measures which, in turn, would provide guidelines for the siting of facilities.

5.3.5 Ecosystem Models

Ecosystem constraints are compounded by simplistic "environmental views". All biological components interact, whether beneficially or detrimentally, through the food chains and cycles that exist within an ecosystem. Although of importance to man, threatened or endangered species are rarely an important part of the ecosystem because of their relatively few numbers. A common species, such as the jackrabbit, may be the center of important food webs, and a decrease in its numbers may greatly affect many other species. The siting methodology and the site clearances were not set up in a manner which allows for evaluation of interrelationships such as these or for shelter relocations or removals for common species such as the jackrabbit. Yet the sheer size of the project indicates impacts at all levels of the ecosystem would be expected. More realistic ecosystem models need to be applied.

5.3.6 Early Completion of Field Surveys

Because of the size of the MX program and the tight time schedules, it was not possible to carry out all tasks in a preferred sequence. One example was the field surveys in the IOC valleys. It was decided to perform these surveys at an early stage in the program to check on the accuracy of the Verification procedures, and the adequacy of the siting methodology, and, at the same time, to obtain site specific information regarding geotechnical and environmental conditions.

The disadvantage of the early completion of field surveys was that archaeological, biological, and historical research designs and sampling surveys had not been completed. These activities were aimed at determining the nature, numbers, distribution, and significance of the archaeological, biological, and historical resources. This information would have aided in the interpretation of the significance of the resources discovered in the IOC valleys and would have helped in designing mitigation measures.

Another disadvantage of the early completion of the field surveys was that a program had not yet been completed to deal with issues covered by the American Indian Religious Freedom Act of 1978. This program, which started late in FY 81, consisted of consultations with local Native American groups on the potential religious significance of sites and materials in the IOC valleys.

It is recommended that in future programs, research designs and consultations with Native American groups be initiated as early as possible. It would be advantageous if such programs could be completed prior to starting field surveys. However, it is also realized that tight time schedules on large projects sometimes requires the simultaneous performance of tasks which would preferably be performed in sequence.

5.3.7 Summary Comments

In summary, the major recommendations on siting methodology are:

- The use of applied computer graphics to more rapidly handle the large volumes of siting data;
- Initiation of data exchange and coordination meetings between environmental, geotechnical, and siting contractors at the beginning of the project;
- Standardization of map scales at the beginning of the project and the selection of one contractor to produce base maps which can be used by other contractors;
- Initiation of siting coordination meetings as early as possible and determining which federal, state, or county agencies should be involved;
- The development of more realistic ecosystem models to better understand the interrelationships between common species and threatened and endangered species; and
- The initiation of research designs and consultations with Native American groups as early as possible so that the results of these studies can be applied to field surveys.

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APPENDIX A

MX SITE LAYOUT REQUIREMENTS FOR A HORIZONTAL SHELTER WITH SEPARATE TRANSPORTER AND ERECTOR LAUNCHER SYSTEM - NEVADA/UTAH, 6 June 1980

E-TR-58-I

M-X SITE LAYOUT REQUIREMENTS FOR A
HORIZONTAL SHELTER WITH SEPARATE TRANSPORTER
AND ERECTOR LAUNCHER SYSTEM - NEVADA/UTAH

06 June 1980

APPROVED: W. D. Weisinger Jr.
Lt. Col. W. Weisinger MNNX

George M. Riddle
Lt. Col. G. Riddle, AFRCE

M-X SITE LAYOUT REQUIREMENTS FOR A HORIZONTAL SHELTER WITH SEPARATE TRANSPORTER AND ERECTOR LAUNCHER SYSTEM - NEVADA/UTAH

Requirements used to identify suitable area boundaries for the Designated Deployment Area and specific siting requirements for clusters and the DTN.

1.0 Area acceptable if the depth-to-rock and water exceeds 50 feet.

2.0 Nominal land slope not exceeding 5%.

Occasional 1000 foot sections may be considered having 10% slopes.

3.0 Rolling terrain and area where more than two 10 foot drainages per 1000 feet are excluded.

4.0 Cultural exclusions include:

4.1 Indian reservations and all federal and state forests, parks, monuments designated wilderness areas, recreational areas, archaeological and historical sites. Officially recommend or proposed forests, parks, landmarks, Indian reservations, paleontological, archaeological and historical sites will be identified, as directed, by BMO.

4.2 All federal and state wildlife refuges, national grassland, ranges and preserves.

4.3 High potential economic resource area, including oil and gas fields, strippable coal, oil shale, uranium deposits and known geothermal resource areas.

4.4 Industrial complexes, such as active mining areas, tank farms and pipeline complexes.

4.5 Populated areas - Twenty statute mile exclusion areas from cities having populations of 25,000 or more; three and one-half statute mile exclusion areas from cities having population of between 5,000 and 25,000; one statute mile from boundaries of all communities with populations less than 5,000.

4.6 Surface water, which includes all significant lakes, reservoirs, swamps, perennial drainages and playas subject to flooding, as shown on 1:62,500 map.

4.7 Power and Generating Plants Separation Distances

1) 750' separation between overhead powerlines of less than 50 KV and the shelter site from the fence.

2) 1250' separation between overhead powerlines of 50 to 250 KV and the shelter site from the fence.

3) 2500' separation between overhead powerlines of 250 KV or more and the shelter site from the fence.

Manned facilities with radio communications equipment or the RSS shall not be located in close proximity to electrical power generation and distribution facilities. Excepting these transmission lines necessary to supply commercial electrical power to the facilities, the following separation distances shall be maintained.

1) 5000' from 45 KV or greater voltage rating overhead power transmission line.

2) 1000' from less than 45 KV voltage rating overhead power transmission line.

3) 5 statute miles between a power generating system and any of the facilities above.

This is not an automatic exclusion - consideration may be given to powerline relocation.

4.8 Avoid U.S. Corp of Engineer recommended social and cultural exclusions, where possible, per the March 1980 Real Estate Planning Report.

4.9 Avoid private and state property, if possible.

4.10 Identify designated non-attainment air quality and environmentally sensitive areas.

5.0 Cluster Layout Criteria

5.1 Pattern and Spacing - Linear Grid

5.1.1 Open Space Areas

Open Hexagonal Pattern (See Attachment A)

Spacing 5,200 ± 200 ft.; can exceed + 200, but not less than -200 (i.e., spacing can never be less than 5000 ft.)

No more than three nearest (5,200 ft.) neighbors to any protective structure.

5.1.2 Number of Protective Structures

34-1/2 protective structures positions (sites) over grid cluster -- alternate clusters of 34 and 35. Identify for description for withdrawal application purpose, the layout of 23 shelters conforming to above requirements.

5.2 Grid Cluster Roads

5.2.1 Roads cannot co-exist with, or cross, federal, state and county roads with a ADT of > 250 vehicles per day.

5.2.2 Roads may co-exist with and cross roads below ADT of 250 vehicles per day.

5.2.3 Roads can cross from one suitable area to another through a non-suitable area, as long as slope criteria and environmental exclusions are not violated.

5.2.4 Min. horizontal radius of curvative grid and shelter spur roads -- 400 feet.

5.2.5 Roads should be oriented in a North-South direction to the greatest extent possible.

5.2.6 Trunk road grades to not exceed 5%. Occasional 1000 foot sections may be considered having 10% slopes

5.3 Quantity Distances per AFR 127-100 - Protective Structures CMFS to:

- o Existing roads with an ADT of > 50 (current) - 1780'
- o Inhabited buildings - 2965'
- o Pipelines - 300'
- o Above ground POL - 1800'
- o Above ground electrical distribution lines > 15000V - 1780'
- o Radio/Microwave facilities - 2965'
- o SAFS - 2965'
- o Area Support Centers - 2965'

6.0 Designated Transportation Network (DTN) Roads

6.1 DTN roads shall not co-exist with interstate highways, state highways or county roads, unless terrain dictates the need to co-exist; e.g., mountain passes.

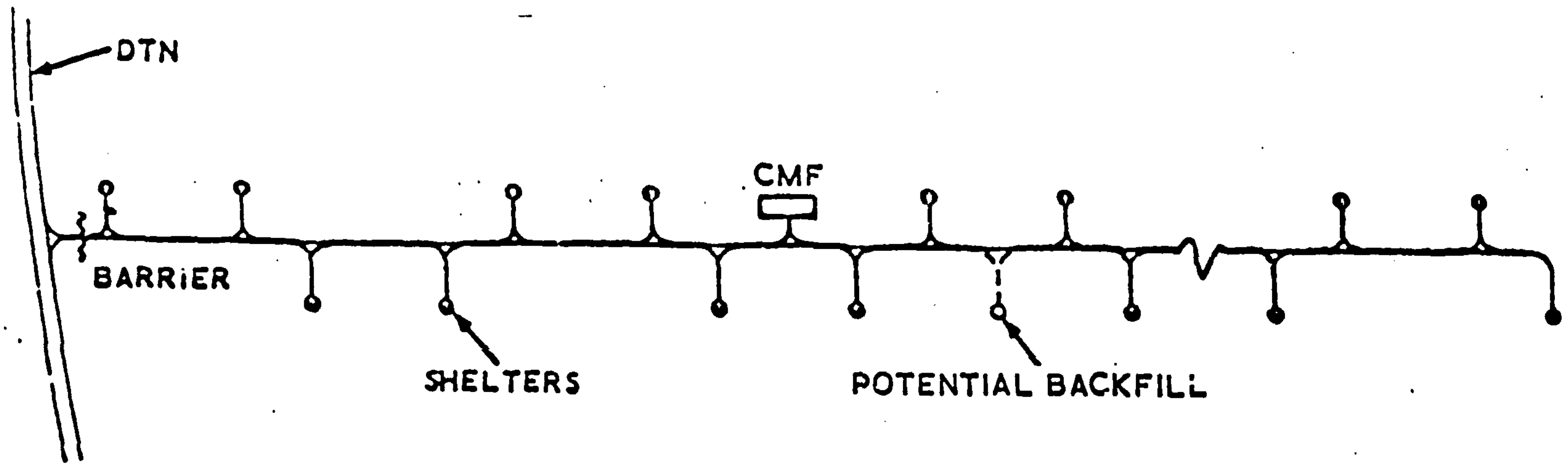
6.2 Maximum Grade 7%.

6.3 Avoid

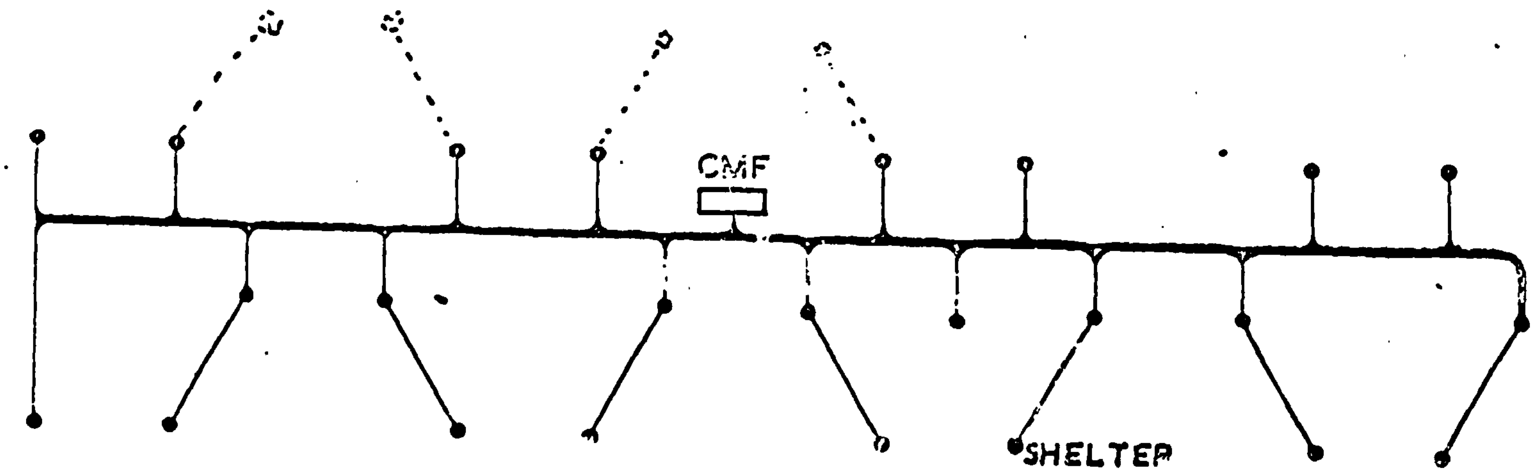
- o Inhabited Buildings (TBD)
- o Indian Reservations
- o Federal and State Parks, Monuments
- o Grass Lands, Historic Sites, Game Preserves, and refuges.

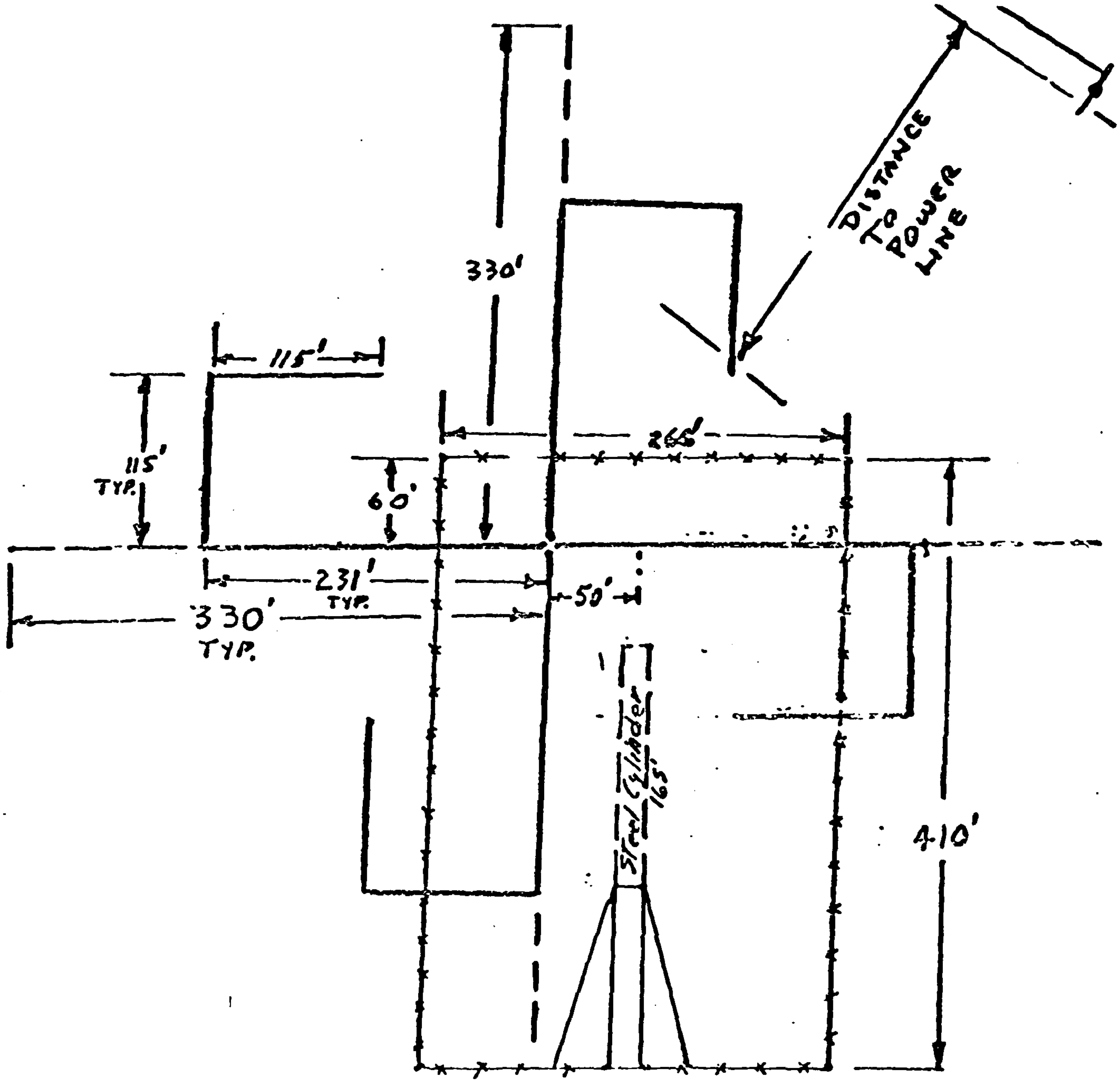
UNCLASSIFIED

Modified 2/3 Hex Pattern
Normal Road-Preferred



Alternate





CONCEPT PLOT PLAN OF PROTECTIVE STRUCTURE WITH FOLDED AND UNFOLDED OPTIONS BURIED MF ANTENNA (CONCEPT) SUPERIMPOSED INSIDE FENCE.

ATTACH B.

APPENDIX B

CHRONOLOGY OF MPS/HSS SITING REQUIREMENTS

1979

2 Aug. Change from vertical silo to horizontal shelter.

15 Oct. Revision of MPS spacing to average 7000'.

22 Oct. MBO issues ground rules for MX conceptual layouts.

1980

Mar. Implementation of the Cooper-Port concept (backfills)

14 Apr. TRW memo on Nuclear Hardness and Survivability (NH & S).

18 Apr. BMO directive for 2/3 filled hexagonal layouts.

12 May TRW memo establishing the use of 5200' spacing, 2/3 filled hexagonal layout and CRN change from closed loop to linear (straight trunk).

6 June BMO/AFRCE-MX issue "M-X Site Layout Requirements for a Horizontal Shelter with Separate Transporter and Erector Launcher System--Nevada/Utah".

10 July Action items from siting meeting at Ertec to incorporate inhabited building data and power line locations onto siting maps.

30 July NH&S spacing and orientation requirements implemented.

18 Aug. Incorporation of long range radar (RSS alternative) to siting layouts.

15 Oct. Stopped posting security roads to layouts (These would be added later by the security people.)

3 Nov. BMO/AFRCE-MX provide approximate cost figures to facilitate trade-off studies; CRN = $155 k/mile, DTN = $355K/mile, State land = $3.6K/section.

10 Nov. BMO issues "Siting Criteria for M-X Designated Deployment Area."

17 Nov. MX baseline changes from 5 to 4 ASCs.

1 Dec. BMO issues "MX Horizontal Shelter Weapons System Baseline Configuration."

1981

7 Jan. MX baseline changes: CRN changed from straight trunk to direct connect; discontinue siting RSSs and RSS alternatives.

4 Feb. BMO notification of HSS shape change from rectangle to dodecagon.

17 Feb. BMO notification of MF antenna configurations (i.e. cross dipole, and folded cross dipole).

24 Feb. Implementation of "Maximum packing" concept to layout compilations.

25 Feb. BMO directive: approving use of backfill locations for primary shelters on case-by-case waiver; MF antenna locations must avoid drainages.

5 Mar. AFRCE-MX action item from technical/operational review: reassess the strict interpretation of geotechnical siting requirements (i.e. adverse terrain).

17 Mar. Air Force Minerals Policy for MX issued.

4 May TRW memo detailing technical/operational siting review comments pertaining to backfill QDs, relaxation of NH&S spacing/orientation requirements,CRN grades/lengths of spurs.

4 June AFRCE-MX requests valley clustering for a sample valleys. (5200' spacing, 2/3 filled hexagonal layouts).

8 Sept. AFRCE-MX requests sample valley clustering (1.73 mile spacing, full hexagonal layout).

APPENDIX C

LIST OF BASE MAPS AND SOURCES USED BY ERTEC

The following is a list of the USGS quadrangle maps used in the compilation of the 'E' size and valley size base maps. Each quadrangle is listed alphabetically according to its corresponding 'E' size grid cell number. The published date and map scale of each topo quad is also indicated. Where a blank appears, a 7 1/2-minute (1:24,000) topo quad was used; one asterisk (*) symbolizes a 15 minute (1:62,500) topo quad sheet, and two asterisks(**) represent a 2 degree (1:250,000) sheet.

In addition to the USGS quadrangles, some 'E' size base maps and valley size base maps utilized Ertec Airborne Systems topographic base maps at the scale of 1:62,500. A list of the valleys employing the Airborne Systems maps with their corresponding 'E' cell number is shown at the end of this inventory.

'E' FORMAT GRID CELL NUMBER	USGS QUADRANGLE NAME	PUBLISHED DATE	MAP SCALE
1	Basalt	1967	
	Belleville	1967	
	Benton	1962	
	Blair Junction	1968	*
	Candelaria	1967	
	Coaldale	1968	
	Coaldalene	1968	
	Columbus	1967	
	Davis Mountain	1962	*
	Jack Spring	1967	
	Little Hunton Valley	1967	
	Miller Mountain	1967	
	Rhyolite Ridge	1978	*
	Rock Hill	1968	
	Teels Marsh	1967	
2	Carvers	1971	
	Carvers NE	1971	
	Carvers NW	1971	
	Carvers SE	1971	
	Ione	1948	*
	Pablo Canyon Ranch	1971	
	Round Mountain	1971	
	Tonopah	1956-71	**
3	Baxter Spring	1963	*
	Manhattan	1971	
	San Antonio Ranch	1964	*
	Seyler Peak	1971	
	Tonopah	1956-71	**
4	Crow Spring	1968	
	Devils Gate	1968	
	Gilbert	1968	
	Gilbert SE	1968	
	Klondike	1970	
	Lone Mountain	1961	*
	Mud Lake	1952	
	Paymaster Canyon	1970	
	Silver Peak	1978	*
	Tonopah	1974	
	Tonopah	1961	*
5	Alkali	1970	
	Goldfield	1952	*
	Lida Wash	1978	*
	Montezuma Peak	1970	
	Montezuma Peak SE	1970	
	Montezuma Peak SW	1970	
	Mud Lake	1952	*
	Paymaster Ridge	1970	
	Silver Peak	1978	*
	Split Mountain	1970	

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MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE
BMO/AFRCE-MX

LIST OF BASE MAPS AND SOURCES USED BY ERTEC

'E' FORMAT GRID CELL NUMBER	USGS QUADRANGLE NAME	PUBLISHED DATE	MAP SCALE
6	Carico Lake	1962	*
	Cortez	1938	*
	Hall Creek	1956	*
	Horse Creek Valley	1967	*
	Roberts Creek Mountain	1949	*
	Waiti Hot Springs	1956	*
7	Ackerman Canyon	1956	*
	Antelope Peak	1956	*
	Bartine Ranch	1956	*
	Hikison Summit	1978	*
	Mount Callaghan	1956	*
	Spencer Hot Springs	1960	*
8	Antelope Peak	1956	*
	Diana's Punch Bowl	1960	*
	Hickison Summit	1978	*
	Horse Haven Mountain	1956	*
	Spencer Hot Springs	1960	*
	Wildcat Peak	1960	*
9	Barley Creek	1971	
	Box Spring	1971	
	Corcoran Canyon	1971	
	Danville	1971	
	Dobbin Summit	1971	
	Fish Springs	1968	
	Fish Springs NE	1968	
	Fish Springs SE	1968	
	Green Monster Canyon	1971	
	Jefferson	1971	
	Jet Spring	1971	
	Morey Peak	1967	
	Mosquito Creek	1971	
	Mt. Jefferson	1971	
	Northumberland Pass	1971	
	Pine Creek Ranch	1971	
	Stargo Creek	1968	
	Upper Fish Lake	1967	
10	Antelope Spring	1971	
	Belmont East	1971	
	Belmont West	1971	
	Big Ten Peak East	1971	
	Big Ten Peak West	1971	
	Blue Jay Spring	1967	
	Eagle Pass	1971	
	Elkhorn Canyon	1971	
	Flagstaff Mountain	1968	
	Georges Canyon Rim	1971	
	Georges Canyon Rim SE	1971	
	Hobble Canyon	1968	
	Little Fish Lake	1968	
	McCann Canyon	1971	
	McIntyre Summit	1971	
	Saulsbury Basin	1971	
	Tybo	1968	
	Tybo SE	1967	
11	Belle Helen	1968	
	Cactus Peak	1952	*
	Kawich Peak	1952	*
	Stinking Spring	1952	*
	Tonopah	1956-71	**
	Warm Springs	1968	
	Warm Springs NW	1968	
	Warm Springs SW	1968	
12	Cactus Peak	1952	*
	Cactus Spring	1952	*
	Kawich Peak	1952	*
	Mellan	1952	*
	Quartzite Mountain	1952	*
	Stinking Spring	1952	*

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30 NOV 81

'E' FORMAT GRID CELL NUMBER	USGS QUADRANGLE NAME	PUBLISHED DATE	MAP SCALE
13	Cold Creek Ranch	1957	*
	Diamond Springs	1957	*
	Garden Valley	1949	*
	Mineral Hill	1937	*
	Railroad Pass	1959	*
	Sherman Mountain	1959	*
14	Bellevue	1956	*
	Buck Mountain	1957	*
	Eureka	1953	*
	Pancake Summit	1951	*
	Pinto Summit	1953	*
	Whistler Mountain	1956	*
15	Bellevue Peak	1956	*
	Cockalorum Wash	1956	*
	Green Springs	1951	*
	Moody Peak	1964	*
	Pancake Summit	1951	*
	Pinto Summit	1953	*
16	Blue Eagle Springs	1978	*
	Brown Summit	1968	
	Brown Summit NW	1968	
	Brown Summit SW	1968	
	Chaos Creek	1967	
	Duckwater	1964	*
	Moores Station	1967	
	Park Mountain	1968	
	Portuguese Mountain	1968	
	Portuguese Mountain NW	1968	
	Pritchard Station	1968	
	Red Ring Mountain	1968	
	Sand Spring	1968	
	Summit Station	1968	
17	Black Rock Summit	1968	
	Blue Eagle Springs	1978	*
	Buckwheat Rim	1967	
	Chuck Wagon Flat	1967	
	Lockes	1968	
	Lunar Crater	1967	
	Moores Station SE	1967	
	Moores Station SW	1967	
	Palisade Mesa	1967	
	The Wall	1968	
	The Wall NE	1968	
	The Wall SE	1968	
	The Wall SW	1968	
	Troy Canyon	1964	*
18	Caliente	1954-70	**
	Echo Canyon	1968	
	Lund	1956-70	**
	Reveille	1968	
	Reveille NE	1968	
	Reveille Peak	1952	*
	Twin Spring Slough	1968	
19	Belted Peak	1952	*
	Caliente	1954-70	**
	Reveille Peak	1952	*
	Tempiute Mountain	1964	*
	White Blotch Springs	1952	*
20	Elko	1955-72	**
	Franklin Lake NE	1968	
	Franklin Lake NW	1969	
	Franklin Lake SE	1968	
	Frankline Lake SW	1968	
	Ruby Lake NE	1968	
	Ruby Lake NW	1968	

'E' FORMAT GRID CELL NUMBER	USGS QUADRANGLE NAME	PUBLISHED DATE	MAP SCALE
21	Elko	1955-72	**
	Ely	1956-71	**
	Ruby Lake SE	1968	
	Station Butte	1969	
22	Ely	1956-71	**
	Illipah	1951	*
	McGill	1958	*
	McGill	1978	
	Riepetown	1959	*
23	Comins Lake	1976	
	East Ely	1958	
	Ely	1958	*
	Ely	1978	
	Groux Wash	1976	
	Illipah	1951	*
	Preston Reservoir	1959	*
	Riepetown	1959	*
	Riepetown	1976	
	Ruth	1958	
	Treasure Hill	1949	*
24	Badger Hole Spring	1973	
	Brown Knoll	1973	
	Bullwhack Summit	1973	
	Currant	1964	*
	Currant Mountain	1957	*
	Douglas	1973	
	Haggerty	1969	
	Lund	1978	
	Moorman spring NE	1969	
	Moorman Spring NW	1969	
	Parker Station	1969	
	Preston	1978	
	Sawmill Canyon	1973	
	White Rock Creek	1973	
25	Cave Valley Well	1971	
	Currant	1964	*
	Forest Home	1964	*
	Gap Mountain	1969	
	Hot Creek Butte	1969	
	Moorman Spring	1969	
	Moorman Spring SE	1969	
	Shingle Pass	1969	
	Shingle Pass SE	1969	
	Sidehill Spring	1971	
	Silver King Well	1971	
	Sunnyside	1969	
	Sunnyside NW	1969	
26	Bailey Wash	1971	
	Caliente	1954-70	**
	Coyote Spring	1971	
	Deadman Spring	1970	
	Deadman Spring NE	1970	
	Lund	1956-70	**
	Oreana Spring	1970	
	Silver King Mountain	1971	
	Silver King Mountain SW	1971	
	Timber Mountain Pass East	1971	
	Timber Mountain Pass NE	1971	
	Timber Mountain Pass NW	1971	
	Timber Mountain Pass West	1971	
	Weepah Spring	1970	

'E' FORMAT GRID CELL NUMBER	USGS QUADRANGLE NAME	PUBLISHED DATE	MAP SCALE
27	Caliente	1954-70	**
	Deadman Spring SE	1970	
	Fossil Peak	1970	
	Hiko	1970	
	Hiko SE	1970	
	Hiko NE	1970	
	Pahroc Spring	1970	
	Pahroc Spring NE	1970	
	Pahroc Spring SE	1970	
	Pahroc Summit Pass	1970	
	Seaman Wash	1970	
	Wheatgrass Spring	1970	
	White River Narrows	1970	
28	Alamo	1969	
	Alamo NE	1969	
	Alamo SE	1969	
	Ash Springs	1969	
	Caliente	1954-70	**
	Delamar	1969	
	Delamar Lake	1969	
	Delamar NW	1969	
	Delamar 3 NE	1969	
	Delamar 3 NW	1969	
	Gregerson Basin Lake	1969	
	Lower Pahranagat Lake	1969	
	Lower Pahranagat Lake NW	1969	
29	Burro Basin	1973	
	Caliente	1954-70	
	Dead Horse Ridge	1973	
	Delamar 3 SE	1969	
	Delamar 3 SW	1969	
	Dog Bone Lake North	1973	
	Dog Bone Lake South	1973	
	Lower Pahranagat Lake SE	1969	
	Lower Pahranagat Lake SW	1969	
	Mule Deer Ridge	1969	
	Mule Deer Ridge NE	1969	
	Mule Deer Ridge NW	1969	
	Mule Deer Ridge SE	1969	
	Wildcat Wash NE	1969	
	Wildcat Wash NW	1969	
	Wildcat Wash SE	1969	
	Wildcat Wash SW	1969	
30	Arrow Canyon	1958	*
	Black Hills	1973	
	Black Hills NW	1973	
	Black Hills SW	1973	
	Corn Creek Springs	1974	
	Corn Creek Springs NW	1974	
	Dry Lake	1952	*
	Gass Peak	1952	*
	Hayford Peak	1960	*
	White Sage Flat	1973	
31	Elko	1955-72	**
	Ferguson Flat	1972	
	Ferguson Mountain	1972	
	Utah Peak	1972	
	White Horse Pass	1972	
32	Elko	1955-72	**
	Ely	1956-71	**
33	Ely	1956-71	**
	Schell Peaks	1959	

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LIST OF BASE MAPS AND SOURCES USED BY ERTEC

'E' FORMAT GRID CELL NUMBER	USGS QUADRANGLE NAME	PUBLISHED DATE	MAP SCALE
34	Ely	1956-71	**
	Connors Pass	1959	*
	Sacramento Pass	1959	*
	Schell Peaks	1959	*
35	Big Springs	1972	
	Cattle Camp Spring	1973	
	Garrison	1949	*
	Horse Camp Springs	1973	
	Indian Springs Knolls	1973	
	Lake Valley Summit	1978	
	Mt. Grafton	1973	
	Mt. Grafton NE	1973	
	North Spring Point	1973	
	Red Ledges	1973	
	Tweedy Wash	1972	
	Wheeler Peak	1948	*
36	Atlanta	1973	
	Dutch John Mountain	1973	
	Gleason Basin	1971	
	Gouge Eye Well	1973	
	Grassy Mountain	1973	
	Hamlin Well	1972	
	Horse Corral Pass	1973	
	Hyde Well	1972	
	Miller Canyon	1972	
	Miller Wash	1972	
	Mustang Well	1973	
	Milk Ranch Spring	1978	
	Pony Springs	1973	
	Rosencrans Knolls	1972	
	Schoolmarm Basin	1973	
	The Gouge Eye	1979	
	Trail Canyon	1973	
	Wells Summit	1973	
37	Bristol Range NE	1971	
	Bristol Range SE	1953	
	Bristol Well	1971	
	Buck Wash Well	1972	
	Caliente	1954-70	**
	Deer Lodge Canyon	1972	
	Eagle Valley Reservoir	1972	
	Ely Springs	1970	
	Fairview Peak	1970	
	Highland Peak	1953	
	Mt. Wilson	1970	
	Mt. Wilson SW	1970	
	Parsnip Peak	1970	
	Pierson Summit	1970	
	Pioche	1953	
	Rice Mountain	1972	
	Rose Valley	1970	
	White Rock Peak	1972	
38	Acoma	1972	
	Bennett Pass	1970	
	Caliente	1970	
	Caliente NW	1970	
	Chief Mountain	1970	
	Chokecherry Mountain	1970	
	Condor Canyon	1970	
	Dow Mountain	1972	

'E' FORMAT GRID CELL NUMBER	USGS QUADRANGLE NAME	PUBLISHED DATE	MAP SCALE
38	Eccles	1972	
	Indian Cove	1972	
	Islen	1972	
	Mosey Mountain	1972	
	Panaca	1970	
	Panaca Summit	1972	
	Pine Park	1972	
	Prohibition Flat	1972	
	The Bluffs	1970	
	Uvada	1972	
39	Blue Nose Peak	1973	
	Bunker Peak	1973	
	Docs Pass	1973	
	Dodge Spring	1973	
	Elgin	1969	
	Elgin NE	1969	
	Elgin SW	1969	
	Ella Mountain	1973	
	Fife Mountain	1973	
	Garden Spring	1973	
	Jacks Mountain	1973	
	Leith	1973	
	Lime Mountain	1973	
	Lyman Crossing	1973	
	Scarecrow Peak	1973	
	Slidy Mountain	1969	
	Vigo NE	1969	
	Vigo NW	1969	
40	Carp	1973	
	Davidson Peak	1969	
	Farrier	1969	
	Mesquite	1957	*
	Moapa Peak	1969	
	Moapa Peak NW	1969	
	Moapa Peak SE	1969	
	Rox	1969	
	Rox NE	1969	
	Rox SE	1969	
	Sunflower Mountain	1969	
	Terry Benches	1973	
	Toquop Gap	1973	
	Tule Spring	1973	
	Vigo	1969	
41	Gold Butte	1953	*
	Moapa	1958	*
	Muddy Peak	1953	*
	Overton	1958	*
	Overton Beach	1958	*
	Virgin Peak	1958	*
42	Boyd Station	1972	
	Clifton	1973	
	Delta	1953-72	**
	Fish Springs NE	1967	
	Fish Springs NW	1967	
	Fish Springs SW	1967	
	Goshute	1972	
	Goshute Canyon	1972	
	Granite Peak SE	1954	
	Ibapah	1973	
	Ibapah Peak	1972	
	Indian Farm Creek	1972	
	Mud Lake Reservoir	1972	
	Toole	1953-70	**

'E' FORMAT GRID CELL NUMBER	USGS QUADRANGLE NAME	PUBLISHED DATE	MAP SCALE
43	Cowboy Pass	1978	*
	Gandy	1978	*
	Granite Mountain	1960	*
	Sand Pass	1967	
	Sand Pass NE	1967	
	Sand Pass NW	1967	
	Sand Pass SE	1967	
	Swasey Peak	1972	
	Swasey Peak NW	1972	
	Trout Creek	1961	*
44	Conger Mountain	1960	*
	Conger Range	1960	*
	Cowboy Pass	1978	*
	Gandy	1978	*
	Marjum Pass	1972	
	Notch Peak	1960	*
	Swasey Peak	1972	
45	Burbank Hills	1960	*
	Crystal Peak	1960	*
	Frisco Peak	1978	*
	Mormon Gap	1971	
	The Barn	1960	*
	Tunnel Spring	1971	*
	Wah Wah Summit	1978	*
46	Buckhorn Spring	1972	
	Camerdorf Peak NW	1971	
	Frisco	1959	*
	Frisco Peak	1978	*
	Halfway Summit	1971	
	Lemerdorf Peak	1971	
	Lopers Spring	1972	
	Miners Cabin Wash	1972	
	Mountain Home Pass	1971	
	Pine Grove Reservoir	1971	
	Sawtooth Peak	1971	
	Sewing Machine	1971	
	Wah Wah Summit	1978	*
47	Atchison Creek	1971	
	Avon	1951	
	Avon NW	1978	
	Bannion Spring	1972	
	Beryl	1978	
	Bible Spring	1971	
	Blue Mountain	1971	
	Burns Knoll	1971	
	Eightmile Spring	1978	
	Latimer	1971	
	Lund	1971	
	Mountain Spring Peak	1972	
	Observation Knoll	1971	
	Pinto Spring	1971	
	Steamboat Mountain	1971	
	Steamboat Mountain SW	1971	
	The Tetons	1971	
	Zane	1972	

'E' FORMAT GRID CELL NUMBER	USGS QUADRANGLE NAME	PUBLISHED DATE	MAP SCALE
48	Antelope Peak	1978	
	Avon SE	1978	
	Beryl Junction	1972	
	Clark Farm	1972	
	Desert Mound	1978	
	Enterprise	1972	
	Hebron	1972	
	Heist	1972	
	Modena	1972	
	Mount Escalante	1972	
	Newcastle	1972	
	Page Ranch	1978	
	Pinon Point	1972	
	Pinto	1972	
	Silver Peak	1978	
	Stoddard Mountain	1978	
	Water Creek Canyon	1972	
	Yale Crossing	1971	
49	Beaver Dam Mountains NE	1955	
	Central East	1972	
	Central West	1972	
	Cedar City	1953-71	**
	Gold Strike	1972	
	Gunlock	1972	
	Hurricane	1954	*
	Maple Ridge	1972	
	Montoqua	1972	
	New Harmony	1957	*
	Saddle Mountain	1972	
	St. George	1957	*
	Veyo	1972	
50	Camels Back Ridge NE	1955	
	Camels Back Ridge NW	1954	
	Deseret Peak	1955	*
	Dugway Proving Ground NE	1954	
	Dugway Proving Ground NW	1954	
	Davis Knolls	1955	
	Hickman Knolls	1973	
	Onoqui Mountains South	1971	
	Tabbys Peak	1955	
	Tabbys Peak SE	1955	
	Tabbys Peak SW	1955	
	Wig Mountain	1955	
	Wig Mountain NE	1955	
	Wig Mountain NW	1954	
	Wig Mountain SW	1954	
51	Camel Back Ridge SW	1955	
	Coyote Springs	1955	
	Desert Mountain Pass	1971	
	Dugway Pass	1953	
	Dugway Proving Ground SE	1954	
	Dugway Proving Ground SW	1954	
	Dugway Range NE	1953	
	Dugway Range NW	1953	
	Dugway Range	1953	*
	Erickson Knoll	1971	
	Erickson Wash SW	1971	
	Dugway Range	1953	*
	Erickson Knoll	1971	
	Erickson Wash SW	1971	
	Indian Peaks	1955	
	Indian Springs	1955	
	Keg Mountain Ranch	1971	
	Keg Pass	1971	
	Lookout Pass	1971	
	Simpson Springs	9155	
	Table Mountain	1955	

'E' FORMAT GRID CELL NUMBER	USGS QUADRANGLE NAME	PUBLISHED DATE	MAP SCALE
52	Baker Hot Springs	1971	
	Crater Bench Reservoir	1971	
	Delta	1953-72	*
	Desert Mountain Reservoir	1971	
	Drum Mountains Well	1971	
	Fumarole Butte	1971	
	Little Drum Pass	1972	
	Picture Rock Hills	1971	
	Rain Lake	1971	
	Smelter Knolls West	1971	
	Smelter Knolls EAst	1971	
	The Hogback	1971	
	Topaz	1953	*
	Whirlwind Valley NW	1972	
53	Clay Knolls	1971	
	Clear Lake	1971	
	Crafts Lake	1971	
	Delta	1978	*
	Long Ridge	1972	
	Long Ridge Reservoir	1972	
	Long Ridge SE	1972	
	Long Ridge SW	1972	
	Neels	1971	
	Pavant Butte North	1971	
	Pavant Butte South	1971	
	Pot Mountain	1971	
	Red Knolls	1972	
	Red Pass	1971	
	Rocky Knoll	1971	
	Sunstone Knoll	1971	
	Whirlwind Valley SW	1972	
54	Antelope Spring	1973	
	Beaver Lake Mountains	1978	*
	Black Rock	1973	
	Bordon	1973	
	Candland Spring	1973	
	Cat Canyon	1973	
	Cave Fort	1978	*
	Cruz	1973	
	Headlight Mountain	1972	
	Needle Point	1972	
	Sevier Lake NE	1972	
	Sevier Lake SW	1972	
	Tabernacle Hill	1962	*
55	Adamsville	1958	*
	Beaver	1958	*
	Beaver Lake Mountains	1978	*
	Cave Canyon	1976	
	Cave Fort	1978	*
	Milford	1958	*
	Milford	1978	
	Milford Flat	1978	
	Pinnacle Pass	1973	
	Ranch Canyon	1976	
	Read	1973	
56	Buckhorn Flat	1971	
	Burnt Peak	1971	
	Cottonwood Mountain	1971	
	Enoch NE	1978	
	Enoch NW	1978	
	Greenville Bench	1971	
	Kane Canyon	1971	
	Little Creek Peak	1971	
	Minersville	1958	*
	Minersville	1978	
	Ninemile Knoll	1978	
	Paragonah	1971	
	Parowan Gap	1971	
	Thermo	1958	*

LIST OF BASE MAPS AND SOURCES USED BY ERTEC

'E' FORMAT GRID CELL NUMBER	USGS QUADRANGLE NAME	PUBLISHED DATE	MAP SCALE
57	Cedar Breaks	1958	*
	Cedar City	1978	
	Cedar City NW	1978	
	Cedar Mountain	1979	
	Enoch	1978	
	Fivemile Ridge	1971	
	Kanarraville	1978	
	Panguitch Lake	1958	*
	Parowan	1971	
	Red Creek Reservoir	1971	
	Summit	1971	
	The Three Peaks	1978	
58	Allens Ranch	1948	
	Boulter Peak	1969	
	Cherry Creek	1963	
	Dutch Peak	1963	
	Eureka	1975	
	Goshen	1979	
	Goshen Valley North	1975	
	Lofgreen	1971	
	Maple Peak	1963	
58	McIntyre	1954	
	Mona	1979	
	Sabie Mountain	1963	
	Santaquin	1979	
	Slate Jack Canyon	1979	
	Tintic Junction	1975	
	Tintic Mountain	1975	
	Vernon	1971	
	West Mountain	1975	
59	Champlin Peak	1967	
	Chriss Canyon	1965	
	Furner Ridge	1967	
	Jericho	1967	
	Lynndyl	1978	*
	Nephi	1951	*
	Oak City	1951	*
	Sage Valley	1967	
	Scipio North	1952	*
	Skinner Peaks	1965	
60	Coffee Peak	1969	
	Gunnison	1966	
	Hayes Canyon	1966	
	Hells Kitchen Canyon SE	1965	
	Hells Kitchen Canyon SW	1965	
	Holden	1962	
	Holden	1978	*
	Oak City	1951	*
	Redmond	1966	
	Redmond Canyon	1966	
	Scipio Lake	1969	
	Scipio North	1952	*
	Scipio Pass	1969	
	Scipio South	1969	
	The Sink	1962	
61	Aurora	1966	
	Boobe Hole Reservoir	1968	
	Fillmore	1962	*
	Filmore	1961	
	Meadow	1960	
	Monroe	1978	*
	Mt. Catherine	1961	
	Rex Reservoir	1966	
	Richfield	1978	*
	Salina	1966	
	Sevier	1978	*
	Sigurd	1966	
	Water Creek Canyon	1968	

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LIST OF BASE MAPS AND SOURCES USED BY ERTEC

'E' FORMAT GRID CELL NUMBER	USGS QUADRANGLE NAME	PUBLISHED DATE	MAP SCALE
62	Abes Knoll	1969	
	Burrville	1968	
	Delano Peak	1937	*
	Greenwich	1969	
	Jakes Knoll	1969	
	Koosharem	1968	
	Marysvale	1978	*
	Monroe	1978	*
	Parker Knoll	1969	
	Sevier	1978	*

GRID CELL NUMBER	ERTEC AIRBORNE SYSTEMS TOPOGRAPHIC BASE MAPS (1:62,500)	DATE
18	Garden/Coal, Penoyer	1978
19	Garden/Coal, Penoyer, Railroad	1978
26	Garden/Coal	1978
27	Garden/Coal	1978
33	West Snake Valley	1978
34	West Snake Valley	1978

LIST OF BASE MAPS AND SOURCES USED BY ERTEC

APPENDIX D

LAYOUT CHECK LIST

SHELTER LAYOUT REVIEW CHECKLIST

VALLEY ________________ STATE ________________ VERSION ________________

NUMBER OF CLUSTERS ________________ DATE OF REVIEW ________________

LAYOUT TABULATION

	TOTAL
FACILITIES	
EXTRA PRIMARY SITES	________
EXTRA BACKFILL SITES	________
CLUSTERS	________
CMFs	________
RSSs	________
BARRIERS	________

CRITERIA	FEET
MINIMUM DISTANCE FROM THE SHELTER TO THE TRUNK ROAD	________
MINIMUM DISTANCE FROM THE SHELTER TO THE DTN	________
MINIMUM SPACING BETWEEN SHELTERS	________
MEAN AVERAGE SPACING BETWEEN SHELTERS	________
MAXIMUM SPACING BETWEEN SHELTERS	________

NOTE: FOR SPACING AND ORIENTATION DATA, SEE PROGRAM PRINTOUT.

DTN ROAD (INDICATE YES OR NO)

DOES THE DTN CONNECT TO ALL CLUSTERS?	________
DOES THE DTN CONNECT TO ADJOINING VALLEYS THROUGH AN APPROPRIATE PASS ROUTE?	________

LAYOUT AUTHORIZATION ________________ DATE ________

FINAL AUTHORIZATION ________________ DATE ________

DATE SENT TO GRAPHICS ________________

VALLEY ________ STATE ________ VERSION ________

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SHELTER LAYOUT REVIEW CHECKLIST

VALLEY ______________ STATE ______________ VERSION ______________

NUMBER OF CLUSTERS ______________ DATE OF REVIEW ______________

INSTRUCTIONS: CIRCLE CODE NUMBER AND SEE SUPPLEMENTARY SHEET FOR SHELTERS AFFECTED.

GEOTECHNICAL CRITERIA	CODE
EXCLUSIONS	
AREAS OF OUTCROPPING ROCK OR SHALLOW ROCK	1
AREAS OF SURFACE SLOPE GREATER THAN 10%	2
AREAS OF STANDING WATER, SWAMPS OR PERENNIAL STREAMS	4
AREAS WHERE DEPTH TO ROCK IS LESS THAN 50 FEET	5
AREAS WHERE DEPTH TO WATER IS LESS THAN 50 FEET	6
AREAS OF ACTIVE PLAYA	8
CONSIDERATIONS	
AREAS OF ADVERSE TERRAIN	3
AREAS OF FAULT RUPTURE HAZARD	7
AREAS OF POTENTIAL SHEET WASH HAZARD	9
AREAS OF SURFACE SLOPE GREATER THAN 5%	Y
OTHER CONSIDERATIONS	10
a. DUNES	10A
b. DESICCATION CRACKS	10B
c. TUFA TOWER	10C
d. BOULDER FIELDS	10D

GEOTECHNICAL AUTHORIZATION ______________ DATE ______

FAULTS AUTHORIZATION ______________ DATE ______

NON-GEOTECHNICAL CRITERIA	CODE
EXCLUSIONS	
WILDERNESS AREAS	11
COE RECOMMENDED EXCLUSIONS	12
HIGH POTENTIAL MINERAL RESOURCE AREAS	12A
CONSIDERATIONS	
STATE LAND	13
PRIVATE LAND	14
PATENTED MINING CLAIMS	15
MATERIAL SITES	16
OTHER CONSIDERATIONS	17
a. WILDERNESS AREA UNDER APPEAL	17A

NON-GEOTECHNICAL AUTHORIZATION ______________ DATE ______

VALLEY ______ STATE ______ VERSION ______

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SHELTER LAYOUT REVIEW CHECKLIST

SUPPLEMENTARY SHEET

VALLEY ________________ STATE ____________ VERSION ____________

CLUSTER NUMBER	SHELTER NUMBER	CODE NUMBER	LEGAL DESCRIPTION			RECOMMENDED ALTERNATIVE (INDICATE NONE, IF APPLICABLE)
			R	T	S	

VALLEY ____________ STATE ____________ VERSION ____________

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APPENDIX E

PROGRAMMATIC MEMORANDUM OF AGREEMENT (PMOA) REQUIREMENTS

PROGRAMMATIC MEMORANDUM OF AGREEMENT REQUIREMENTS

A Programmatic Memorandum of Agreement (PMOA) is a plan executed by The Advisory Council on Historic Preservation with agencies involved in large-scale projects to cover cultural resources data recovery methods. It also outlines consultation methods which establish how the agencies involved and the State Historic Preservation Officer will be involved in the decision-making process regarding cultural resources.

For the MX project, a PMOA was developed among the Advisory Council, the Air Force, the Bureau of Land Management, and the State Historic Preservation Offices involved. A management plan for the implementation of the PMOA was also produced. The PMOA was based on a set of historic preservation laws and the Native American Religious Freedom Act.

Several stipulations were included in the PMOA. Throughout the implementation of the PMOA, the Air Force and its contractors were to consult with State Historic Preservation and State BLM offices to obtain comments on proposed scopes of work and study products. The Air Force was directed to provide an initial study plan and schedule to guide work under the PMOA. This work included developing research designs to guide background research and field survey in all of the cultural resources disciplines. The stipulations called for two stages of field work; the first, a preliminary study of sample areas during initial environmental analyses of the potential impact areas, to predict when adverse effects upon cultural resources would be likely. The second stage involved intensive survey of all locations where adverse effects would be likely in the vicinity of project facilities.

The Air Force was directed to avoid adverse effects where possible through facility design, by relocating existing facilities, or other means. The stipulations also specified, pursuant to the American Indian Religious Freedom Act of 1978, consultation with groups that have cultural ties to the study area to identify locations and issues of concern to them, resolve conflicts, and to consider the concerns during implementation of the PMOA and design and construction of the project.

Ertec's siting study of the IOC valleys fell under the second stage of PMOA field work, involving background research and intensive survey of locations where cultural resources might be adversely affected by project facilities. This study was designed to provide background information and field survey results for facility location in Dry Lake, Pine, and Wah Wah valleys and afford an opportunity for altering the siting layout to mitigate adverse effects to significant resources. Thus, the IOC study was to follow development of the overall PMOA implementation plan and schedule, discipline research designs and initial field sampling studies. As a result of compressed project schedules, the IOC study was undertaken before some other PMOA tasks were finished, limiting the effectiveness of the IOC study, as discussed in the body of this report.

The primary authorities on which the siting process was based and those which provided the inpetus for the PMOA included the National Historic Preservation Act of 1966 (16 U.S.C. Sec. 47f, as amended 90 Stat. 1320), Executive Order 11593, and the American Indian Religious Freedom Act of 1978. These and other complementary authorities including the Antiquities Act of 1906, the Historic Sites Act of 1935, the National Environmental Policy Act of 1969, the Archeological and Historic Preservation Act of 1974, and the Archeological Resources Protection Act of 1979 are implemented by the Advisory Council on Historic Preservation in "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800).

The National Historic Preservation Act established the National Register of Historic Places, committed the federal government to identifying significant historic properties, and directed federal agencies to consult with the Advisory Council before adversely affecting a National Register property. Executive Order 11593 directed federal agencies to identify and nominate historic properties to the National Register and avoid unnecessarily damaging those that might be eligible.

The Antiquities Act of 1906 established the initial federal concern for archaeological and historical remains and is used to control work on federal lands through a permitting process. The Historic Sites Act of 1935 gave the Secretary of the Interior the power and responsibility to undertake a variety of activities for historic preservation.

The National Environmental Policy Act of 1969 requires federal agencies to consider the impacts of their activities on cultural resources during planning. The Archeological and Historic Preservation Act of 1974 empowers agencies to undertake recovery of scientific data to mitigate impacts on significant historic properties. The Archeological Resources Protection Act of 1979 provides for adequate criminal penalties for those convicted of destroying antiquities and the promotion of greater public involvement in the cultural resources permitting procedure.

The procedures outlined in 36 CFR Part 800 coordinate implementation of all these authorities as follows:

- An agency identifies historic properties in the impact area of its undertaking and consults with the State Historic Preservation Officer (SHPO) to determine whether the properties may qualify for the National Register.
- If the properties qualify, the agency must determine whether the undertaking will affect them and if the effects will be adverse.
- If the properties are eligible, the agency requests comments by the Advisory Council on Historic Preservation which is aimed at bringing an agreement among the agency, the council, and the SHPO about avoiding or mitigating impact.

APPENDIX F

VALLEY CLUSTERING DATA/RESULTS

1.1 REGIONAL STUDIES FOR VALLEY CLUSTERING

Items 1 through 13 will be examined under each of the following conditions:

A. Horizontal shelters - 2/3 hex, 5200-foot spacing, 50 feet to both rock and water.

B. Horizontal shelters - full hex, 5200-foot spacing, 50 feet to both rock and water.

C. Vertical shelters - 2/3 hex, 5200-foot spacing, 150 feet to both rock and water.

D. Vertical shelters - full hex, 5200-foot spacing, 150 feet to both rock and water.

E. Horizontal shelters - 23:1 clustered will be examined for case 7 through 12 using Ertec's May 15 numbers.

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1. Find the most compact system using 4600 shelters and 15 percent - Coyote MOB.
2. Find the most compact system using 4600 shelters and 15 percent - Milford MOB.
3. Repeat #1, but avoid all MOAs and Restricted Areas.
4. Repeat #2, but avoid all MOAs and Restricted Areas.
5. Repeat #1, but avoid the Delamar/Pahroc valleys.
6. Repeat #2, but avoid the Delamar/Pahroc valleys.
7. Best 2300 shelters and 15 percent - Coyote MOB.
8. Best 2300 shelters and 15 percent - Milford MOB.
9. Repeat #7, but avoid all MOAs and Restricted Areas.
10. Repeat #8, but avoid all MOAs and Restricted Areas.
11. Repeat #7, but avoid the Delamar/Pahroc valleys.
12. Repeat #8, but avoid the Delamar/Pahroc valleys.
13. Repeat #'s 1, 3, 5, 7, 9, and 11 for Nevada only.
14. Best 1150 shelters and 15 percent - Coyote MOB.
15. Best 1150 shelters and 15 percent - Milford MOB.
16. Repeat #14, but avoid all MOAs and Restricted Areas.
17. Repeat #15, but avoid all MOAs and Restricted Areas.
18. Repeat #14, but avoid Delamar/Pahroc valleys.
19. Repeat #15, but avoid Delamar/Pahroc valleys.
20. Repeat #s 14, 16, and 18 for Nevada only.

---

o TRW numbers will be used for A (1-13)
B (1-13) = A x 1.5
C (1-13)
D (1-13)

o Ertec cluster numbers will be used for cases E (7-12).

o Cases A-D (7, 9, 11) - One ASC will be at Milford.

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VALLEY CLUSTERING DATA

TABLE 1
AVAILABLE SHELTER

	VALLEY CLUSTERING, 5200' SPACING				23:1 CLUSTERING 50' TO ROCK AND WATER
	50' TO ROCK AND WATER		150' TO ROCK AND WATER		
UTAH	OPTION A 2/3 HEX	OPTION B FULL HEX	OPTION C 2/3 HEX	OPTION D FULL HEX	OPTION E 2/3HEX
Dugway	132	198	114	171	115
Fish Springs Flat	99	148	50	75	46
Pine	249	374	242	363	115
Sevier Desert	142	213	62	93	46
Sevier Lake	70	105	57	86	23
Snake	650	975	390	585	437
Tule	367	550	198	297	230
Wah Wah	213	320	175	263	115
Whirlwind	291	436	215	322	276
Utah Subtotal	2,213	3,319	1,503	2,255	1,403
NEVADA					
Antelope	125	188	51	76	92
Big Sand Springs	70	105	57	86	69
Big Smoky	430	645	189	284	230
Butte	293	440	264	396	207
Cave	79	118	70	105	69
Coal	219	328	201	302	138
Delamar/Pahroc	170	255	138	207	138
Dry Lake	284	426	267	400	230
Garden	161	242	126	189	138
Hamlin	333	500	186	279	230
Hot Creek	167	250	99	148	138
Jakes	89	134	83	124	69
Kobeh	150	225	8	12	115
Lake	191	286	94	141	161
Little Smoky	195	292	137	206	92
Long	125	188	80	120	92
Monitor	276	414	83	124	138
Muleshoe	81	122	69	104	69
Newark	177	266	96	144	115
Penoyer	212	318	146	219	115
Railroad	455	682	273	410	299
Ralston	312	468	256	384	207
Reveille	91	136	74	111	69
Spring	121	182	68	102	92
Stone Cabin	331	496	159	238	184
White River	398	597	191	286	276
Nevada Subtotal	5,535	8,303	3,465	5,197	3,772
TOTAL	7,748	11,622	4,968	7,452	5,175

TABLE 2
DATA MATRIX
PAGE 1 OF 3

OPTION	NUMBER OF SHELTERS	NUMBER OF VALLEYS	NUMBER OF ASCs	DTN LENGTH (Statute miles)
A1	5332	21	3	540
B1	5370	16	2	373
C1	4968	35	4	927
D1	5481	23	3	538
A2	5324	24	3	
B2	5324	15	2	
C2	4968	35	4	
D2	5332	24	3	
A3	4885	27	3	
B3	5303	20	2	
C3	2976	27	3	
D3	4464	27	3	
A4	4885	27	3	
B4	5303	20	2	
C4	2976	27	3	
D4	4464	27	3	
A5	5365	22	3	
B5	5549	15	2	
C5	4830	34	4	
D5	5306	22	3	
A6	5333	24	3	
B6	5351	16	2	
C6	4830	34	4	
D6	5327	23	3	
A13-1	5321	25	3	
B13-1	5392	17	2	
C13-1	3395	26	3	
D13-1	5092	26	3	
A13-3	4601	25	3	
B13-3	5368	20	2	
C13-3	2747	25	3	
D13-3	4120	25	3	
A13-5	5240	25	3	
B13-5	5336	16	2	
C13-5	3257	25	3	
B13-5	4885	25	3	
A7	2690	14	2	277
B7	2661	9	2	198
C7	2633	19	3	350
D7	2650	13	2	252
E7	2346	18	2	546
A8	2833	11	2	
B8	2719	5	1	
C8	2646	17	2	

TABLE 2

DATA MATRIX

PAGE 2 OF 3

OPTION	NUMBER OF SHELTERS	NUMBER OF VALLEYS	NUMBER OF ASCs	DTN LENGTH (Statute miles)
D8	2639	10	2	
E8	2300	14	2	
A9	2644	17	2	
B9	2635	13	2	
C9	2678	21	3	
D9	2650	16	2	
E9	2323	18	2	
A10	2640	17	2	
B10	2683	11	1	
C10	2678	21	3	
D10	2892	17	2	
E10	2323	18	2	
A11	2726	14	2	
B11	2734	9	2	
C11	2711	19	3	
D11	2720	12	2	
E11	2300	19	2	
A12	2833	11	2	
B12	2719	5	1	
C12	2654	17	2	
D12	2639	10	2	
E12	2300	14	2	
A13-7	2645	14	2	
B13-7	2669	10	1	
C13-7	2644	20	2	
D13-7	2659	14	1	
E13-7	2346	16	2	
A13-9	2786	16	2	
B13-9	2633	12	1	
C13-9	2656	23	3	
D13-9	2668	16	2	
E13-9	2300	19	2	
A13-11	2683	14	2	
B13-11	2732	10	1	
C13-11	2688	19	3	
D13-11	2667	14	1	
E13-11	2346	16	2	
A14	1392	7	1	167
B14	1529	5	1	138
C14	1346	10	1	216
D14	1392	6	1	150
A15	1339	8	1	
B15	1329	6	1	
C15	1337	8	1	

TABLE 2
DATA MATRIX
PAGE 3 OF 3

OPTION	NUMBER OF SHELTERS	NUMBER OF VALLEYS	NUMBER OF ASCs	DTN LENGTH (Statute miles)
D15	1323	7	1	
A16	1357	9	1	
B16	1339	7	1	
C16	1380	15	1	
D16	1316	9	1	
A17	1324	9	1	
B17	1328	6	1	
C17	1324	14	2	
D17	1429	9	1	
A18	1354	7	1	
B18	1392	5	1	
C18	1354	10	1	
D18	1404	6	1	
A19	1339	8	1	
B19	1329	6	1	
C19	1337	8	1	
D19	1323	7	1	
A20-14	1392	7	1	
B20-14	1529	5	1	
C20-14	1422	11	1	
D20-14	1392	6	1	
A20-16	1398	9	1	
B20-16	1560	7	1	
C20-16	1380	15	1	
D20-16	1334	9	1	
A20-18	1448	8	1	
B20-18	1392	5	1	
C20-18	1332	10	1	
D20-18	1404	6	1	

UTAH

Military Overflight Areas

Gandy
Sevier A
Sevier B

Restricted Areas

R-6402
R-6405
R-6407

NEVADA

Military Overflight Area

Desert

Restricted Areas

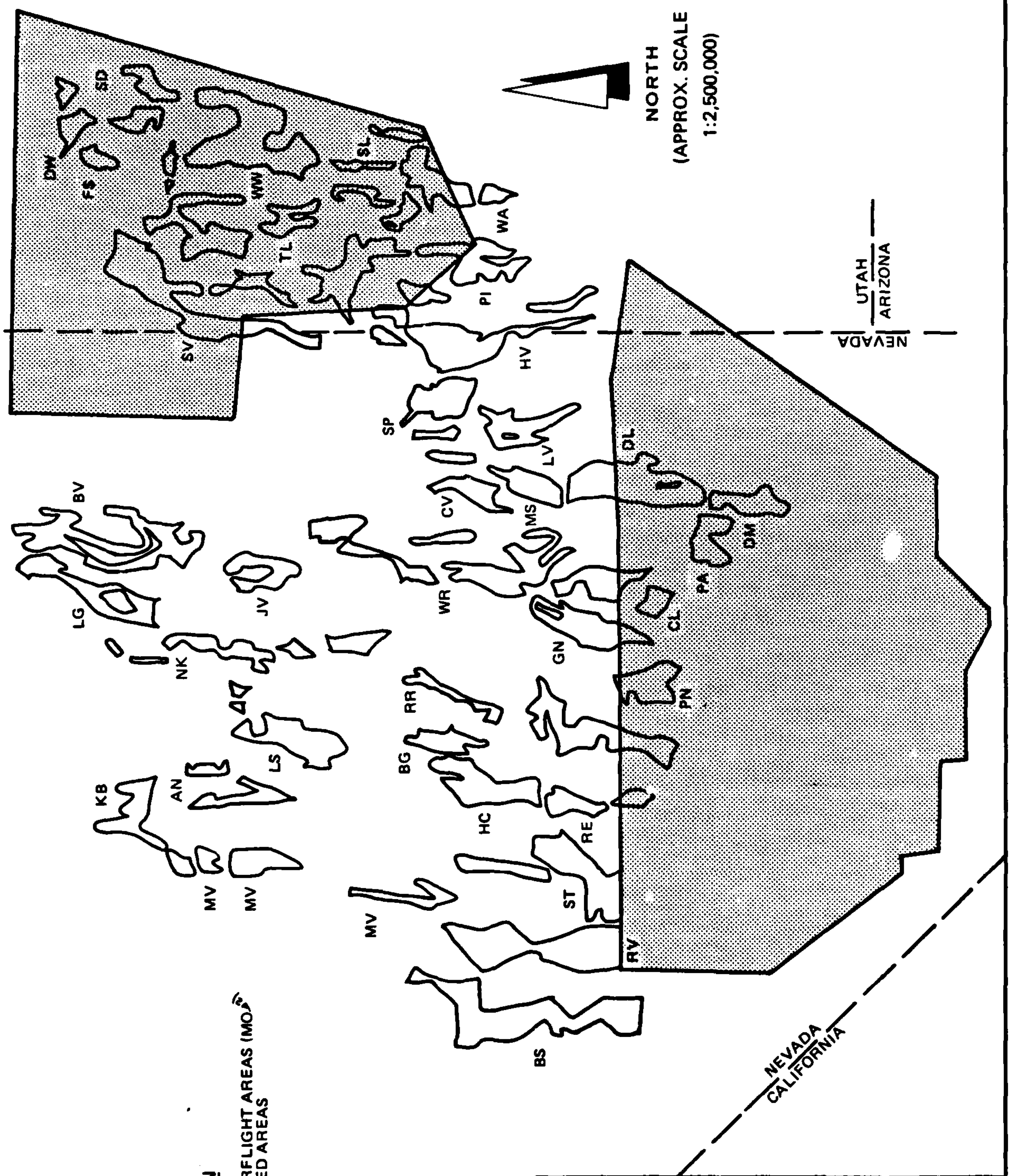
R-4806
R-4807
R-4808N
R-4809

Ertec
The Earth Technology Corporation

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE
BMO/AFRCE-MX

MILITARY OVERFLIGHT AREAS (MOAs)
AND RESTRICTED AREAS

30 NOV 81



EXPLANATION

MILITARY OVERFLIGHT AREAS (MOAs) AND RESTRICTED AREAS

Ertec
The Earth Technology Corporation

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE
BMO/AFRCE-MX

MILITARY OVERFLIGHT AREAS (MOAs)
AND RESTRICTED AREAS
WITHIN THE DDA

30 NOV 81

APPENDIX G

LAND PARCEL DESCRIPTIONS - IOC VALLEYS

APPENDIX G

FIRST INCREMENT
MX SYSTEM
PROPOSED LAND
REQUIREMENTS
FOR
NEVADA
AND
UTAH

Preliminary Land Parcel Description for Initial Operational Capability in

Dry Lake Valley

and

Pine and Wah Wah valleys

FOREWORD

To ensure permanent recording of the location of original land survey monuments, the U.S. Coast and Geodetic Survey worked out a system of plane coordinates for each state that are tied to locations in the national geodetic survey system. Nevada is divided into three state plane zones; west, central, and east. These zones are coincident with county boundaries but not all county boundaries are zone delineations. Dry lake Valley lies in Lincoln County which is in the east zone of the Nevada state plane coordinate system. Utah is divided into three state plane zones; north, central, and south. These zones are coincident with county boundaries but not all county boundaries are zone delineations. Pine and Wah Wah valleys are both divided by the county line between Millard and Beaver counties and thus are in two state plane zones, central and south.

The format used on the following pages shows one cluster per page if the cluster lies totally in one state plane zone. If the cluster crosses the zone boundary, one page for each zone is given. The Cluster Maintenance Facilities (CMFs) are shown together by zone on a separate page.

Bearings are given relative to state plane grid North. Distances shown are ground level in feet without corrections for terrain. Monuments were recovered for about one percent of the section corners used. It is not the intent of these descriptions to establish or imply that section corners are in existence or are known to be in existence or that they should be located as indicated on the accompanying "E" sized, 1:62,500 scale maps.

Cadastral data shown on the accompanying tabular descriptions are based upon calculation and/or completion from record and are not the result of a retracement survey.

Siting requirements can be found in the BMO/AFRCE-MX 6 June 1980 memorandum and subsequent baseline changes and AFRCE-MX directives.

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MX SITING PROJECT
DRY LAKE VALLEY, NEVADA
CLUSTER 1

Being 23 parcels in the County of Lincoln, State of Nevada, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	4S	63E	NW12	S 31° 35' E	1174	S 23° 06' W
2	4S	63E	SE 2	N 37° 32' W	3934	S 83° 54' W
3	4S	64E	NW 7	S 14° 26' E	709	S 37° 06' E
4	4S	64E	NW 6	S 54° 51' E	2100	N 81° 54' E
5	Protracted 3S	63E	SW36	N 39° 50' E	2638	S 52° 12' W
6	3S	64E	NE31	S 12° 23' W	1237	N 40° 12' W
7	3S	64E	NE32	S 55° 38' W	964	N 21° 30' E
8	3S	64E	NE29	N 52° 16' E	1160	S 81° 37' W
9	Protracted 3S	63E	SE13	N 10° 47' W	1257	N 34° 54' W
10	3S	64E	NE20	S 42° 47' W	3628	N 82° 24' E
11	3S	64E	SE18	N 2° 58' W	1707	S 82° 42' W
12	3S	64E	NE21	S 54° 35' W	3242	S 36° 48' E
13	3S	64E	SW 8	N 63° 20' E	2171	N 35° 12' W
14	3S	64E	SE16	N 12° 59' W	2848	N 83° 18' E
15	3S	64E	SW 9	N 45° 22' E	2389	S 36° 36' E
16	3S	64E	SE 4	N 61° 49' W	1983	N 83° 12' E
17	2S	64E	NW 4	S 58° 02' E	649	N 25° 12' E
18	3S	64E	NW 5	S 57° 40' E	952	S 25° 18' W
19	2S	64E	NE31	S 51° 46' W	2778	S 84° 127 W
20	2S	64E	NE30	S 0° 27' W	2398	N 37° 54' W
21	2S	64E	NE29	S 12° 34' W	1692	S 37° 24' E
22	2S	64E	SW19	N 50° 48' E	2556	S 80° 30' W
23	2S	64E	SE17	N 37° 54' W	2325	N 21° 00' E

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Nevada State Plane Coordinate System, Grid North, East Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
DRY LAKE VALLEY, NEVADA
CLUSTER 2

Being 23 parcels in the County of Lincoln, State of Nevada, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	4S	64E	SW 4	N 19° 19' E	466	S 20° 48' N
2	4S	64E	SW 3	N 6° 04' W	1169	S 39° 42' E
3	3S	64E	SW34	N 75° 57' E	2029	N 36° 00' W
4	3S	64E	NE33	S 58° 04' W	1233	S 80° 12' W
5	3S	64E	SW35	N 48° 49' E	2193	S 37° 42' E
6	3S	64E	NW27	S 34° 20' E	1538	N 38° 49' W
7	3S	64E	SE26	N 62° 31' W	1828	N 80° 06' E
8	3S	64E	SW24	N 52° 16' E	1160	N 80° 25' E
9	3S	64E	NW23	S 84° 55' E	2848	S 27° 05' W
10	3S	64E	NE15	S 15° 01' W	2300	S 81° 06' W
11	3S	64E	NW24	S 87° 17' W	3198	S 39° 18' E
12	3S	64E	NE13	N 81° 29' W	985	S 73° 27' E
13	Protracted 3S	65E	NW 7	S 62° 23' E	713	N 77° 39' E
14	3S	64E	NE 1	S 62° 44' W	3278	S 18° 34' W
15	3S	65E	NW 6	S 77° 40' E	2039	S 41° 33' E
16	Protracted 2S	64E	NE 1	S 56° 46' W	1968	N 80° 04' E
17	2S	64E	SW25	N 53° 17' E	1780	S 22° 18' W
18	2S	64E	SE23	S 82° 46' W	1638	S 81° 48' W
19	2S	65E	SW30	N 29° 41' E	2072	S 38° 42' E
20	2S	65E	SE19	N 64° 10' W	2614	N 80° 54' E
21	2S	64E	SE13	S 75° 27' E	64	S 80° 42' W
22	2S	65E	NW18	S 72° 12' E	2075	N 37° 30' W
23	2S	65E	SW 8	N 62° 33' E	2480	N 21° 59' E

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Nevada State Plane Coordinate System, Grid North, East Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
DRY LAKE VALLEY, NEVADA
CLUSTER 3

Being 23 parcels in the County of Lincoln, State of Nevada, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	Protracted 3S	63E	NE15	S 18° 21' E	550	S 83° 30' W
2	Protracted 3S	63E	SW12	N 65° 50' E	1446	S 33° 10' E
3	Protracted 3S	63E	NE12	S 84° 41' W	1620	N 85° 48' E
4	3S	64E	NE 7	N 84° 33' W	1620	S 35° 51' E
5	Protracted 3S	63E	NW23	N 86° 45' E	5077	S 17° 00' W
6	Protracted 2S	63E	NE36	S 34° 18' W	3536	N 18° 13' W
7	Protracted 2S	63E	SE26	N 18° 44' W	988	N 59° 54' E
8	Protracted 2S	63E	SW24	N 48° 49' E	2219	S 0° 45' W
9	Protracted 2S	63E	NW23	S 58° 13' E	2828	N 0° 08' E
10	Protracted 2S	63E	NE14	S 23° 33' W	2015	S 85° 04' W
11	2S	64E	SE18	N 59° 19' W	2014	N 88° 27' E
12	2S	64E	SW 7	N 71° 03' E	2358	S 50° 30' E
13	Protracted 1S	63E	SW35	N 69° 14' E	2278	S 72° 02' W
14	Protracted 2S	63E	NE11	S 89° 44' W	853	S 47° 44' W
15	2S	64E	SW 6	N 71° 28' E	3238	S 21° 11' W
16	Protracted 2S	63E	NE 1	S 63° 30' W	1000	S 79° 45' W
17	2S	64E	SE 5	N 61° 52' W	2792	S 39° 04' E
18	1S	64E	NW31	S 38° 36' E	1726	N 79° 12' E
19	1S	64E	SE32	N 39° 09' W	888	N 80° 12' E
20	Protracted 1S	63E	NE25	S 42° 30' W	3050	N 18° 13' E
21	Protracted 1S	63E	SE26	N 69° 60' W	2530	N 42° 31' W
22	Protracted 1S	63E	SE25	N 30° 02' W	3199	S 26° 44' E
23	Protracted 1S	63E	SE24	N 19° 03' W	2608	N 80° 55' E

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Nevada State Plane Coordinate System, Grid North, East Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
DRY LAKE VALLEY, NEVADA
CLUSTER 4

Being 23 parcels in the County of Lincoln, State of Nevada, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	2S	64E	NE23	S 66° 12' W	1020	N 82° 10' E
2	2S	64E	NW14	S 47° 39' E	2161	S 85° 00' W
3	2S	64E	NE11	S 27° 20' W	2751	N 37° 31' W
4	2S	64E	NE12	S 36° 24' W	2470	S 38° 13' E
5	2S	65E	NW 6	S 15° 38' E	2462	N 81° 07' E
6	1S	64E	NE33	S 9° 20' E	959	N 38° 32' W
7	1S	64E	NE34	S 78° 26' W	217	S 37° 20' E
8	1S	64E	SE35	N 64° 05' W	2479	S 22° 05' W
9	1S	64E	SE36	N 54° 08' W	3110	S 38° 31' E
10	1S	64E	NE21	S 29° 05' W	2747	N 35° 55' W
11	1S	64E	NW26	S 70° 18' E	1949	N 81° 04' E
12	1S	64E	SE25	N 23° 04' W	1304	N 83° 05' E
13	1S	64E	NE22	S 2° 01' W	1896	N 20° 22' E
14	1S	64E	SW24	N 89° 51' E	2082	S 83° 09' W
15	1S	65E	SE30	N 17° 25' W	1994	S 36° 11' E
16	1S	64E	NE14	S 61° 07' W	5268	N 81° 06' E
17	1S	64E	NE24	S 59° 38' W	1346	N 37° 07' W
18	1S	64E	SE10	N 49° 41' W	2590	S 82° 21' W
19	1S	64E	NW13	S 29° 12' E	1864	S 38° 13' E
20	1S	65E	SE18	N 84° 06' W	1612	S 36° 18' E
21	1S	64E	SE 3	N 0° 49' W	1159	N 37° 44' W
22	1S	64E	NE12	S 47° 14' W	2708	N 80° 00' E
23						

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Nevada State Plane Coordinate System, Grid North, East Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
DRY LAKE VALLEY, NEVADA
CLUSTER 5

Being 23 parcels in the County of Lincoln, State of Nevada, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	1N	64E	SW26	N 17° 07' E	1451	N 23° 06' E
2	1N	64E	NE35	S 36° 34' W	3381	N 84° 19' E
3	1N	64E	NE36	S 44° 19' W	2891	N 21° 26' E
4	1N	65E	SW31	N 80° 47' E	2268	N 66° 24' E
5	1S	65E	NW 7	S 71° 45' E	3516	S 39° 37' E
6	1S	65E	NW17	S 41° 26' E	663	N 83° 12' E
7	1S	65E	SW 3	N 82° 05' E	2125	N 27° 34' E
8	1S	65E	SW 4	N 87° 18' E	2584	N 36° 39' W
9	1S	65E	SW 9	N 31° 28' E	881	S 81° 60' W
10	1S	65E	SE16	N 52° 01' W	2736	N 81° 10' E
11	1S	65E	SE15	N 46° 29' W	2979	N 21° 25' E
12	1S	65E	NW23	S 25° 52' E	2107	N 81° 05' E
13	1S	65E	SW21	N 33° 04' E	2448	S 38° 13' E
14	1S	65E	NE28	S 20° 01' W	2319	S 21° 33' W
15	1S	65E	NE27	S 9° 00' W	1877	N 22° 44' E
16	1S	65E	NW33	S 28° 04' E	2553	S 28° 28' E
17	2S	65E	SW 1	N 6° 00' E	2500	N 42° 23' W
18	1S	65E	SW35	S 88° 49' E	1457	S 78° 48' W
19	1S	65E	SE26	N 82° 00' W	2150	N 79° 47' E
20	1S	65E	SE25	N 59° 12' W	2294	S 49° 22' E
21	1S	65E	NW24	S 38° 14' E	1845	S 81° 24' W
22	1S	65E	NE13	S 45° 20' W	3024	N 38° 14' W
23	Protracted 1S	66E	NW 7	S 8° 00' E	2874	N 41° 39' W

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Nevada State Plane Coordinate System, Grid North, East Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
DRY LAKE VALLEY, NEVADA
CLUSTER 6

Being 23 parcels in the County of Lincoln, State of Nevada, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	1S	64E	NW32	S 70° 38' E	1458	S 37° 52' E
2	1S	64E	NE29	S 60° 11' W	2300	N 81° 37' E
3	1S	64E	NE19	S 14° 52' W	2129	S 78° 37' W
4	1S	64E	NW17	S 76° 30' E	3800	N 83° 45' E
5	Protracted 1S	63E	SW13	N 48° 59' E	1908	S 80° 15' W
6	Protracted 1S	63E	SE12	N 72° 43' W	2135	N 38° 28' W
7	Protracted 1S	63E	NE11	S 25° 38' W	845	S 74° 21' W
8	Protracted 1S	64E	SW 7	N 56° 15' E	2924	N 23° 54' E
9	1S	64E	SE 6	N 7° 32' W	1129	N 82° 52' E
10	1N	63E	SE36	N 42° 17' W	1472	S 81° 50' W
11	1N	64E	SW30	N 64° 42' E	1139	N 38° 33' W
12	1N	64E	SW29	N 29° 49' E	1641	S 36° 42' E
13	1N	64E	SE20	N 73° 14' W	2646	N 83° 30' E
14	1N	64E	NE19	S 3° 25' W	379	S 83° 49' W
15	1N	64E	NW17	S 62° 36' E	2272	N 36° 40' W
16	1N	64E	NE 7	S 28° 30' W	2472	S 79° 07' W
17	Protracted 1N	63E	SE12	N 26° 36' W	2451	S 21° 29' W
18	1N	64E	NW 5	S 0° 51' E	2732	N 79° 48' E
19	2N	64E	SW31	N 63° 22' E	2926	S 80° 33' W
20	2N	64E	SE30	N 29° 33' W	1157	N 37° 20' W
21	2N	64E	SE29	N 26° 10' W	1877	S 38° 39' E
22	2N	64E	SW21	N 46° 47' E	1602	N 83° 08' E
23	2N	64E	NE20	S 77° 49' W	2197	N 17° 21' E

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Nevada State Plane Coordinate System, Grid North, East Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
DRY LAKE VALLEY, NEVADA
CLUSTER 7

Being 23 parcels in the County of Lincoln, State of Nevada, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	1S	64E	NW16	S 31° 41' E	2001	S 37° 22' E
2	1S	64E	NE 9	S 44° 07' W	3286	N 82° 15' E
3	1S	64E	SE 5	N 3° 46' E	1807	S 80° 03' W
4	1N	64E	NE32	S 20° 06' W	3154	N 36° 51' W
5	1N	64E	NE33	S 34° 30' W	2488	S 36° 54' E
6	1N	64E	NW27	S 10° 56' E	2762	N 81° 56' E
7	1N	64E	SE21	N 57° 59' W	2818	S 81° 12' W
8	1N	64E	SE16	N 20° 31' W	902	N 37° 14' W
9	1N	64E	SE15	N 21° 28' W	1855	S 36° 49' E
10	1N	64E	SW11	N 50° 11' E	1669	N 82° 48' E
11	1N	64E	NE10	S 85° 42' W	1687	S 81° 51' W
12	1N	64E	NE 3	S 11° 23' E	792	N 37° 48' W
13	1N	64E	NE 2	N 64° 22' W	242	S 36° 32' E
14	2N	64E	NW36	S 74° 02' E	1917	N 83° 13' E
15	2N	64E	NE26	S 30° 41' W	1977	S 83° 28' W
16	2N	64E	NW24	S 21° 04' E	2306	N 81° 36' E
17	2N	64E	SW22	N 36° 23' E	2147	S 80° 49' W
18	2N	64E	NE27	S 26° 16' W	2555	N 81° 38' E
19	2N	64E	NW34	S 52° 03' E	2827	S 37° 36' E
20	2N	64E	NW33	S 43° 47' E	3612	N 38° 55' W
21	1N	64E	NW 4	S 16° 11' E	2024	S 82° 06' W
22	1N	64E	NE 9	S 67° 16' W	1866	N 81° 50' E
23	1N	64E	NW16	S 85° 46' E	1797	S 36° 46' E

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Nevada State Plane Coordinate System, Grid North,,East Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
DRY LAKE VALLEY, NEVADA
CLUSTER 8

Being 23 parcels in the County of Lincoln, State of Nevada, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	1N	64E	SW23	N 72° 40' E	2629	N 36° 59' N
2	1N	64E	SW24	N 40° 00' E	2900	N 25° 36' E
3	1N	64E	NE25	S 6° 00' W	1800	S 24° 18' W
4	Protracted 1N	65E	NE30	S 3° 16' W	2792	S 33° 42' E
5	1N	64E	SE13	N 42° 44' W	1129	N 83° 51' E
6	1N	64E	SW20	N 49° 55' E	2564	N 88° 31' E
7	1N	64E	NW13	S 80° 39' E	1559	S 82° 00' W
8	1N	65E	SE18	N 21° 26' W	1676	S 84° 02' W
9	1N	64E	NE12	S 72° 57' W	2124	S 21° 20' W
10	1N	65E	SW 8	N 48° 55' E	1601	N 38° 44' W
11	1N	65E	NE 7	N 88° 38' W	2122	S 81° 02' W
12	1N	65E	NE 8	S 15° 06' W	953	S 64° 10' E
13	1N	65E	NE 6	S 21° 15' W	640	N 37° 56' W
14	1N	65E	NE 5	N 79° 44' W	538	S 35° 38' E
15	2N	65E	NW31	S 51° 06' E	2639	S 82° 59' W
16	2N	64E	SW27	N 11° 18' E	2339	S 52° 48' E
17	2N	65E	SW22	N 35° 20' E	2552	N 29° 11' W
18	2N	65E	SW23	N 40° 47' E	1840	N 32° 44' E
19	2N	65E	SE14	N 49° 48' W	1852	S 27° 09' E
20	2N	65E	SW35	N 57° 29' E	2325	S 81° 20' E
21	1N	65E	NE 4	S 32° 59' W	1892	S 8° 33' E
22	1N	65E	SE 3	N 23° 41' W	3009	S 21° 33' E
23	2N	65E	SE15	N 41° 40' W	2328	N 87° 02' E

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Nevada State Plane Coordinate System, Grid North, East Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
DRY LAKE VALLEY, NEVADA
CLUSTER 9

Being 23 parcels in the County of Lincoln, State of Nevada, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	2N	65E	NE29	S 57° 39' W	2304	S 36° 30' E
2	2N	65E	NE30	S 40° 16' W	2530	S 27° 20' W
3	2N	65E	NW19	S 29° 16' E	1824	S 86° 55' W
4	2N	65E	NE18	S 46° 48' W	3331	N 85° 10' E
5	2N	64E	SE12	N 0° 07' W	1985	S 37° 06' E
6	2N	64E	SE11	N 1° 07' W	1498	S 19° 37' W
7	2N	64E	SW 2	N 80° 50' E	1844	S 80° 53' W
8	2N	64E	NE 2	S 79° 00' W	1755	N 81° 12' E
9	3N	64E	NW35	S 15° 42' E	1613	N 20° 39' E
10	3N	64E	NW34	S 21° 03' E	2053	S 22° 12' W
11	3N	64E	SW28	N 53° 30' E	3555	S 82° 08' W
12	3N	64E	SE21	N 24° 33' W	1608	N 81° 52' E
13	3N	64E	SW16	N 82° 17' E	1592	N 22° 36' E
14	3N	64E	NE16	S 86° 07' W	1872	N 40° 53' W
15	3N	64E	SE10	N 73° 23' W	2196	N 19° 56' E
16	3N	64E	SW14	N 29° 04' E	2199	N 78° 42' E
17	3N	64E	SE22	N 19° 54' W	2463	S 39° 53' E
18	3N	64E	NW26	S 55° 35' E	2997	S 21° 21' W
19	3N	64E	SW25	S 60° 31' E	2620	N 22° 08' E
20	Protracted 3N	65E	SW30	N 13° 13' E	377	N 80° 11' E
21	3N	64E	SE36	N 73° 46' W	1927	S 37° 50' E
22	2N	65E	SW 6	N 56° 17' E	2399	N 82° 31' E
23	2N	65E	SW17	N 52° 54' E	3408	N 39° 06' E

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Nevada State Plane Coordinate System, Grid North, East Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
DRY LAKE VALLEY, NEVADA
CLUSTER 10

Being 23 parcels in the County of Lincoln, State of Nevada, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	2N	64E	SW14	N 58° 15' E	3507	N 20° 09' E
2	2N	64E	SE15	N 61° 34' W	2467	N 38° 08' W
3	2N	64E	NE16	S 72° 30' W	210	N 21° 27' E
4	2N	64E	NE17	S 50° 24' E	666	S 23° 13' W
5	2N	63E	SW12	N 27° 13' E	2321	N 12° 43' W
6	2N	64E	SW 7	N 52° 37' E	1031	S 48° 53' W
7	2N	64E	NW 8	S 53° 18' E	2839	S 85° 09' W
8	2N	64E	SE 4	N 66° 14' W	1989	N 44° 49' E
9	2N	63E	SE 1	N 37° 36' W	712	S 51° 50' W
10	2N	64E	NE 5	S 28° 38' W	2612	N 82° 22' E
11	3N	64E	SW32	N 28° 34' E	1969	N 22° 19' E
12	3N	64E	SW29	N 58° 31' E	2728	N 76° 11' E
13	3N	64E	NE30	S 84° 33' W	985	N 16° 20' E
14	3N	63E	NE26	S 20° 34' W	2394	N 41° 56' W
15	3N	63E	NE25	S 31° 35' W	1312	N 18° 16' E
16	3N	63E	NW24	S 31° 25' E	2434	S 78° 56' W
17	3N	63E	NE13	S 39° 52' W	3431	N 39° 25' W
18	3N	64E	NW18	S 59° 57' E	3196	S 40° 13' E
19	3N	63E	SE11	N 5° 45' E	1591	S 80° 39' W
20	3N	64E	SW 6	N 29° 02' E	2684	N 15° 51' E
21	Protracted 4N	63E	SW36	N 61° 30' E	1776	N 7° 09' E
22	3N	63E	NW11	S 66° 05' E	1278	S 66° 13' W
23	3N	63E	NW 2	S 66° 31' E	2215	N 49° 53' W

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Nevada State Plane Coordinate System, Grid North, East Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
DRY LAKE VALLEY, NEVADA
CMF's

Being 10 parcels in the County of Lincoln, State of Nevada, each having the shape and dimensions as shown on Attachment No. 2, situated as shown with cadastral ties in the tabular form below:

CMF Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through CMF
	Township	Range	Section Corner	Bearing	Distance	
1	3S	64E	SE 8	N 37° 10' E	818	S 67° 24' E
2	3S	64E	NE14	S 9° 12' E	2041	N 68° 48' W
3	2S	64E	SW 7	N 15° 29' E	2929	S 85° 44' E
4	1S	64E	SE22	N 1° 49' W	1679	N 42° 39' E
5	1S	65E	NW21	N 69° 23' E	915	S 51° 08' W
6	1N	64E	SW31	N 79° 01' E	1585	S 67° 27' E
7	1N	64E	SW11	N 6° 55' E	3019	S 66° 46' E
8	1N	65E	NE 5	S 68° 02' W	2982	S 68° 22' E
9	2N	64E	SW 2	N 40° 17' E	3500	S 50° 52' W
10	2N	64E	NW 5	S 33° 02' E	2126	N 50° 07' E

Area of each parcel is 4.25 acres, more or less.
Bearings shown are on the Nevada State Plane Coordinate System, Grid North, East Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
PINE VALLEY, UTAH
CLUSTER 1

Being 23 parcels in the County of Beaver, State of Utah, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	27S	16W	SW18	N 74° 31' E	2774	S 74° 33' E
2	27S	16W	SW 7	N 71° 00' E	2500	N 54° 39' E
3	26S	16W	NW31	S 48° 53' E	2723	N 62° 41' E
4	27S	16W	NW 6	S 46° 17' E	2518	S 56° 29' E
5	27S	17W	SE 1	N 89° 27' W	1450	S 39° 26' W
6	27S	16W	SE11	N 26° 00' W	2700	N 57° 04' W
7	27S	17W	NE14	S 40° 11' W	2552	N 65° 60' W
8	27S	17W	NE23	S 33° 39' W	2089	S 65° 26' E
9	27S	17W	SW23	N 26° 17' E	197	N 53° 24' E
10	27S	17W	NE24	S 0° 54' W	2645	N 76° 25' W
11	27S	17W	NW28	S 59° 53' E	1826	N 67° 42' W
12	27S	17W	SW22	N 13° 21' E	2040	N 5° 43' W
13	27S	18W	NW36	S 42° 30' E	3550	N 61° 50' W
14	27S	17W	SW30	N 85' 24' E	1653	N 0° 11' W
15	27S	17W	NW32	S 38° 30' E	2700	N 58° 21' E
16	27S	17W	SW26	N 62° 13' E	858	S 66° 14' E
17	27S	17W	SW34	N 39° 11' E	3280	S 7° 10' E
18	27S	17W	NE33	S 75° 01' W	2768	S 53° 37' W
19	28S	17W	SW 3	N 19° 07' E	2815	S 55° 48' E
20	28S	17W	SW 4	N 78° 39' E	1673	S 4° 14' W
21	28S	17W	NW 5	S 41° 34' E	3565	N 3° 13' E
22	28S	17W	SE 6	N 67° 02' W	2347	N 57° 19' W
23	28S	17W	SW 7	N 77° 08' E	2472	S 63° 16' W

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, South Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
PINE VALLEY, UTAH
CLUSTER 2

Being 17 parcels in the County of Beaver, State of Utah, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	26S	17W	NE11	S 4° 14' E	2645	S 41° 08' E
3	26S	17W	NW22	S 12° 40' E	1882	S 64° 27' E
4	26S	17W	NE16	S 8° 55' E	1383	N 58° 21' E
5	26S	17W	SW21	N 29° 39' E	821	N 58° 37' W
6	26S	17W	SW28	N 28° 45' E	1076	S 60° 11' W
12	26S	17W	SW29	N 89° 19' E	396	N 20° 27' E
13	26S	18W	NE36	S 38° 30' W	1000	N 40° 60' W
14	27S	18W	NE 1	S 80° 49' W	2014	N 68° 43' W
15	27S	18W	SW12	N 49° 45' E	2848	S 52° 44' E
16	26S	18W	SE 2	N 31° 39' W	871	N 10° 42' W
17	26S	18W	SW13	N 52° 25' E	2165	N 68° 18' W
18	26S	17W	SW19	N 87° 55' E	1032	N 58° 04' W
19	26S	17W	NW20	S 23° 44' E	2094	S 59° 33' E
20	26S	17W	NW18	S 20° 32' E	921	N 14° 33' W
21	26S	17W	NW17	S 24° 29' E	2130	S 7° 29' E
22	26S	17W	SW 9	N 48° 18' E	1105	N 6° 50' W
23	26S	18W	NE12	S 51° 28' W	1201	N 49° 32' E

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, South Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
PINE VALLEY, UTAH
CLUSTER 2

Being 6 parcels in the County of Millard, State of Utah, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
2	26S	17W	SW 1	N 29° 00' E	2600	N 80° 01' E
7	26S	17W	NE 2	S 70° 30' W	2400	N 17° 12' E
8	26S	17W	NE 3	S 45° 00' W	2900	N 16° 39' W
9	26S	17W	NE 4	S 28° 00' W	3750	N 17° 29' E
10	26S	17W	SE 5	N 35° 30' W	2850	S 17° 39' W
11	26S	17W	NE 6	S 0° 00' E	750	S 76° 09' W

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, Central Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
PINE VALLEY, UTAH
CLUSTER 3

Being 5 parcels in the County of Beaver, State of Utah, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	26S	16W	NW16	S 51° 39' E	2468	N 53° 35' W
2	26S	16W	NW21	S 26° 20' E	1774	N 33° 52' E
5	26S	16W	NW20	S 48° 49' E	1397	N 22° 17' W
7	26S	16W	SW10	N 48° 33' E	1558	S 54° 04' E
8	26S	16W	SW 3	N 63° 31' E	1609	N 64° 52' E

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, South Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
PINE VALLEY, UTAH
CLUSTER 3

Being 18 parcels in the County of Millard, State of Utah, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
3	25S	16W	SW15	N 73° 48' E	608	S 13° 53' E
4	25S	16W	NE15	S 6° 26' W	2796	S 53° 14' E
6	25S	16W	NE10	S 7° 44' W	1920	N 61° 48' E
9	25S	16W	SW 3	N 43° 55' E	996	N 1° 15' E
10	25S	16W	SW 6	N 46° 38' E	3194	N 63° 30' W
11	26S	16W	NW 4	S 29° 00' E	3700	N 61° 18' E
12	26S	16W	NW 2	S 4° 33' E	2750	S 57° 32' E
13	25S	16W	NW 5	S 88° 52' E	1414	N 0° 00' E
14	25S	16W	SW33	N 34° 20' E	2403	S 1° 06' W
15	25S	16W	NW32	S 76° 40' E	1865	S 59° 51' W
16	25S	16W	NE33	S 71° 44' E	748	S 67° 37' W
17	25S	16W	NW29	S 69° 37' E	1757	N 60° 00' W
18	25S	16W	NE28	S 10° 35' W	503	S 58° 18' E
19	25S	16W	SW21	N 14° 19' E	2799	S 58° 11' E
20	25S	16W	NW17	N 88° 16' E	1685	S 0° 05' E
21	25S	16W	SW 7	N 45° 37' E	3581	S 59° 02' W
22	25S	16W	NW 9	S 17° 59' E	2348	S 59° 48' E
23	25S	16W	NW 4	S 12° 54' E	2457	N 63° 40' E

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, Central Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
PINE VALLEY, UTAH
CLUSTER 4

Being 23 parcels in the County of Beaver, State of Utah, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	28S	17W	NE12	S 18° 00' W	2800	S 26° 19' E
2	28S	16W	SE 7	N 16° 49' W	1654	S 28° 30' W
3	28S	16W	SW 6	N 66° 14' E	2304	S 67° 56' W
4	27S	16W	SE31	N 12° 49' E	295	S 87° 28' E
5	28S	16W	SE 8	N 21° 23' W	1589	S 31° 23' E
6	28S	16W	NW 3	S 28° 02' E	1903	S 76° 41' W
7	27S	16W	NW22	S 14° 25' E	2278	N 55° 51' W
8	27S	16W	NW34	S 15° 05' E	1738	S 71° 31' W
9	27S	16W	NE28	S 7° 30' W	2000	N 77° 39' W
10	27S	16W	SW11	N 73° 48' W	3808	S 73° 24' E
11	27S	16W	SW14	N 0° 23' W	1277	S 70° 51' E
12	27S	16W	NW10	S 19° 27' E	1978	N 59° 53' W
13	27S	16W	SE 3	N 21° 52' W	1144	S 59° 52' E
14	26S	16W	SE34	N 15° 51' W	2082	N 59° 46' E
15	26S	16W	NE33	S 10° 49' W	605	N 2° 11' E
16	26S	16W	SW33	N 12° 05' E	2519	N 52° 20' W
17	26S	16W	SE35	N 73° 18' W	1118	S 5° 55' E
18	27S	16W	NW 8	S 36° 46' E	2527	N 71° 10' W
19	27S	16W	SE 5	N 3° 41' E	1451	S 61° 31' E
20	27S	16W	SW16	N 22° 50' E	2095	S 83° 12' E
21	27S	16W	NW20	S 48° 15' E	3331	N 53° 23' W
22	27S	16W	NW29	S 44° 48' E	2707	S 56° 52' E
23	27S	16W	SW30	N 76° 52' E	2811	N 59° 17' W

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, South Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
PINE VALLEY, UTAH
CLUSTER 5

Being 23 parcels in the County of Beaver, State of Utah, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	26S	17W	NE23	S 38° 50' W	2263	N 2° 18' E
2	26S	17W	SE24	N 71° 53' W	2390	N 57° 12' W
3	26S	16W	NW31	N 62° 02' W	2378	S 62° 45' W
4	26S	17W	NE35	S 44° 44' W	2591	S 62° 46' E
5	27S	17W	NE 2	S 52° 23' W	2527	S 55° 45' E
6	27S	17W	SW 4	N 42° 53' W	1609	S 0° 34' W
7	27S	17W	NE 4	S 7° 47' W	1597	S 61° 40' W
8	26S	17W	NE33	S 90° 32' W	1810	N 59° 29' W
9	26S	17W	SE27	N 31° 36' W	1513	S 57° 51' E
10	26S	17W	SE22	N 35° 18' W	1237	N 61° 11' E
11	27S	17W	SW 4	N 42° 48' E	1391	S 2° 59' E
12	27S	17W	NW 5	S 21° 32' E	3168	N 4° 17' E
13	27S	17W	NW 7	S 70° 03' E	1413	N 22° 00' W
14	27S	17W	SE10	S 86° 10' W	1307	N 37° 44' E
15	27S	17W	SE 9	N 18° 39' W	2144	N 2° 33' W
16	27S	17W	NW16	S 14° 46' E	1466	N 41° 25' W
17	27S	17W	NW20	S 63° 57' E	2388	N 86° 45' W
18	27S	17W	NE18	S 65° 39' W	1302	N 0° 51' E
19	27S	18W	SE13	N 26° 41' W	2435	N 59° 28' W
20	27S	18W	SE24	N 26° 30' W	2661	S 66° 57' E
21	27S	18W	NW25	S 36° 39' E	3343	N 46° 56' E
22	27S	18W	SW26	N 52° 00' E	2750	N 32° 46' W
23	27S	18W	SW35	N 9° 00' E	2350	S 81° 56' W

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, South Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
PINE VALLEY, UTAH
CMF's

Being 3 parcels in the County of Beaver, State of Utah, each having the shape and dimensions as shown on Attachment No. 2, situated as shown with cadastral ties in the tabular form below:

CMF Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through CMF
	Township	Range	Section Corner	Bearing	Distance	
1	27S	17W	NE28	S 38° 53' W	1122	S 27° 01' E
2	27S	16W	NE31	S 15° 02' W	1925	S 88° 44' E
5	27S	17W	NE 4	S 72° 30' W	2700	N 19° 51' W

Area of each parcel is 4.25 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, South Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
PINE VALLEY, UTAH
CMF's

Being 2 parcels in the County of Millard, State of Utah, each having the shape and dimensions as shown on Attachment No. 2, situated as shown with cadastral ties in the tabular form below:

CMF Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through CMF
	Township	Range	Section Corner	Bearing	Distance	
2	26S	17W	SE 2	N 38° 00' W	3800	S 40° 41' W
3	25S	16W	SE29	S 55° 00' E	1750	S 89° 00' E

Area of each parcel is 4.25 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, Central Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
WAH WAH VALLEY, UTAH
CLUSTER 1

Being 23 parcels in the County of Beaver, State of Utah, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	27S	14W	SW16	N 37° 50' E	1278	N 67° 42' W
2	27S	14W	SW21	N 51° 28' E	2082	S 52° 55' W
3	27S	14W	NE16	S 27° 52' W	1223	N 7° 11' W
4	27S	14W	SE15	N 23° 36' W	2491	N 53° 16' E
5	27S	14W	NW27	S 27° 43' E	2218	N 53° 32' W
6	27S	14W	NE33	S 79° 16' W	2369	N 78° 04' W
7	27S	14W	SE34	N 51° 53' W	807	N 66° 51' E
8	28S	14W	SE 3	N 64° 45' W	1334	S 54° 09' E
9	28S	14W	SW10	N 65° 53' E	2463	S 36° 29' E
10	27S	14W	NE22	S 2° 17' W	2686	S 53° 46' W
11	27S	14W	SE23	N 45° 54' W	961	S 6° 03' E
12	27S	14W	NE24	S 46° 35' W	2575	N 5° 24' W
13	27S	13W	SE19	N 57° 53' W	2698	N 55° 13' E
14	27S	13W	SE30	N 43° 26' W	2109	S 68° 04' E
15	27S	14W	NE36	S 9° 22' W	1626	S 8° 01' E
16	27S	14W	SW25	N 60° 39' E	372	S 51° 51' W
17	28S	13W	NW 6	S 22° 42' E	2428	S 54° 13' W
18	28S	13W	SW 5	N 21° 16' E	1178	N 54° 00' E
19	28S	14W	NE13	S 84° 24' W	2540	N 66° 08' W
20	28S	14W	NW12	S 77° 02' E	2134	N 65° 58' W
21	28S	14W	NE24	S 80° 56' W	1727	N 52° 57' E
22	28S	14W	SE14	N 56° 29' W	2053	S 43° 35' W
23	28S	14W	SE23	N 56° 43' W	1424	S 76° 11' E

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, South Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
WAH WAH VALLEY, UTAH
CLUSTER 2

Being 15 parcels in the County of Beaver, State of Utah, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	26S	14W	SE22	N 57° 48' W	2281	S 22° 40' W
2	26S	13W	NW30	S 72° 00' E	1090	N 80° 28' E
3	26S	14W	SW26	N 14° 46' E	1964	N 65° 06' W
4	26S	14W	SE23	N 51° 00' W	3000	N 38° 58' W
5	26S	14W	SE24	N 26° 06' W	2816	S 81° 54' W
6	26S	14W	NW14	S 57° 21' E	995	N 44° 12' W
7	26S	14W	SW12	N 28° 52' E	1109	S 44° 23' E
8	26S	14W	SW 1	N 70° 31' E	1894	N 74° 49' E
15	26S	13W	NE 7	S 72° 07' W	1068	N 65° 21' E
16	26S	13W	NW 6	S 61° 55' E	3913	N 81° 30' W
19	26S	13W	NE18	N 89° 53' W	1436	S 55° 31' E
20	26S	13W	SW18	N 8° 12' E	2530	N 53° 16' W
21	25S	13W	NE29	S 73° 27' W	1799	N 67° 40' E
22	25S	13W	SE33	N 62° 00' W	2350	N 80° 42' E
23	26S	13W	SW 4	N 11° 30' E	850	S 40° 37' E

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, South Zone.
Distances shown are ground level in feet.

AD-A113 216 ERTEC WESTERN INC LONG BEACH CA F/G 16/1
MX SITING INVESTIGATION. MX SYSTEM SITING SUMMARY REPORT. GENER--ETC(U)
JAN 82 F04704-80-C-0006
UNCLASSIFIED E-TR-58-VOL-1 NL

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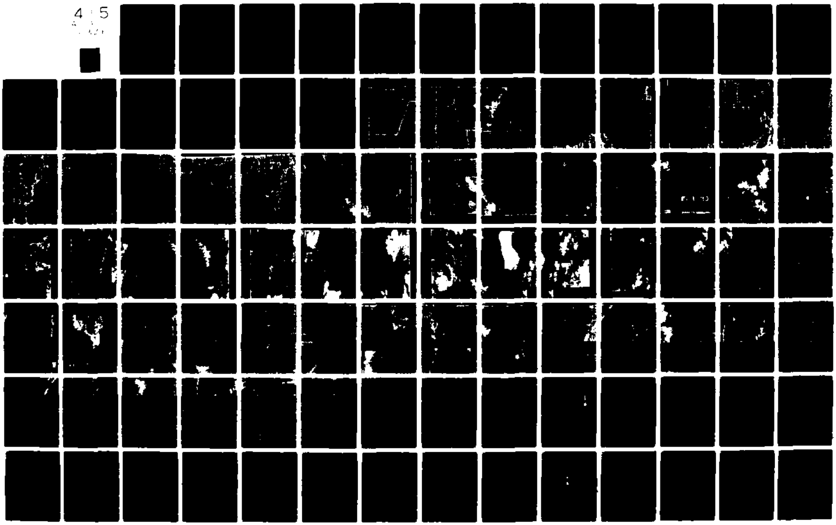

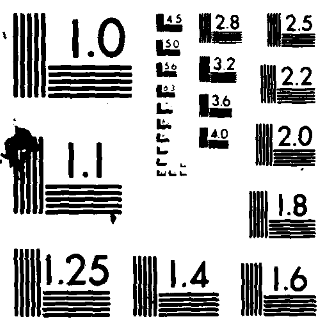
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MX SITING PROJECT
WAH WAH VALLEY, UTAH
CLUSTER 2

Being 8 parcels in the County of Millard, State of Utah, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
9	26S	14W	NE 2	S 49° 04' W	2379	S 76° 12' W
10	25S	14W	NE35	S 19° 47' W	2050	N 43° 38' W
11	25S	14W	NW25	S 17° 22' E	2353	N 43° 05' W
12	25S	14W	NW24	S 40° 12' E	3351	N 42° 12' W
13	25S	13W	SW18	N 8° 08' E	1702	N 41° 54' W
14	25S	13W	NE18	S 87° 46' W	1225	N 13° 11' W
17	25S	13W	NE31	N 6° 45' W	4037	N 41° 34' W
18	25S	13W	NE32	S 73° 07' W	1287	N 15° 43' E

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, Central Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
WAH WAH VALLEY, UTAH
CLUSTER 3

Being 7 parcels in the County of Beaver, State of Utah, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	26S	14W	NW33	S 82° 25' E	1700	S 42° 47' E
2	26S	14W	NE28	S 75° 21' W	2247	N 77° 46' E
3	26S	14W	NE20	S 4° 48' W	2109	S 78° 12' W
4	26S	14W	NW16	S 25° 11' E	2822	N 42° 32' W
5	26S	14W	NW15	S 52° 53' E	898	S 47° 17' E
6	26S	14W	NW10	S 65° 39' E	2291	N 81° 55' E
16	26S	14W	SE32	N 54° 34' W	1863	N 89° 25' W

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, South Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
WAH WAH VALLEY, UTAH
CLUSTER 3

Being 16 parcels in the County of Millard, State of Utah, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
7	26S	14W	NE 4	S 36° 16' W	2629	S 80° 57' W
8	25S	14W	NE33	S 12° 01' W	2626	N 42° 46' W
9	25S	14W	NE34	S 32° 31' W	1168	S 34° 23' E
10	25S	14W	SE22	N 76° 11' W	2625	S 79° 42' W
11	25S	14W	SE15	N 80° 13' W	1100	N 41° 31' W
12	25S	14W	SE14	N 43° 31' W	2174	S 41° 43' E
13	25S	14W	SW12	N 86° 04' E	1809	S 74° 34' E
14	25S	14W	NW12	S 75° 54' E	719	N 46° 36' E
15	26S	14W	NE 5	S 36° 48' W	2777	N 38° 05' W
17	25S	15W	NW12	N 13° 51' W	1160	N 11° 14' W
18	25S	14W	NW10	S 44° 17' E	3553	S 28° 25' W
19	25S	14W	SE 6	N 05° 14' W	1757	S 89° 11' W
20	25S	14W	SW34	N 68° 51' E	2600	N 35° 05' W
21	25S	14W	SE 5	N 05° 46' W	1489	N 31° 31' W
22	25S	14W	NW 7	S 30° 52' E	2567	S 10° 52' E
23	25S	14W	SE 4	S 76° 11' E	1637	S 49° 43' W

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, Central Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
WAH WAH VALLEY, UTAH
CLUSTER 4

Being 23 parcels in the County of Millard, State of Utah, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	24S	14W	NW22	S 25° 40' W	2123	N 12° 38' W
2	24S	14W	NE27	N 23° 22' W	2575	S 12° 37' E
3	24S	14W	NE26	S 87° 23' W	2146	S 64° 23' E
4	24S	14W	NW24	S 47° 11' E	2329	S 83° 54' E
5	24S	13W	NW31	S 72° 24' E	982	S 24° 15' E
6	24S	13W	NE30	S 43° 38' W	1910	S 83° 35' E
7	24S	13W	NW19	S 36° 38' E	2709	N 36° 12' E
8	24S	13W	NE29	S 37° 44' W	2359	N 37° 02' E
9	24S	13W	NW33	S 40° 47' E	1446	S 34° 51' W
10	24S	13W	SE27	N 56° 31' W	2373	S 66° 34' E
11	24S	13W	SW21	N 37° 13' E	3015	N 86° 17' W
12	24S	13W	SE16	N 36° 41' W	2318	N 35° 10' W
13	24S	13W	SW10	N 27° 57' E	1499	N 34° 00' W
14	24S	13W	SW 9	N 0° 00' W	1367	N 20° 00' E
15	24S	13W	SW 8	N 30° 38' E	215	N 53° 08' E
16	24S	13W	SW 7	N 3° 14' E	2545	N 2° 56' W
17	24S	14W	NE14	S 6° 09' W	2313	N 84° 03' W
18	24S	14W	NW12	S 3° 29' E	1725	N 49° 39' E
19	24S	13W	NW23	S 50° 15' E	2680	S 22° 48' W
20	24S	13W	NE13	S 56° 37' W	2142	N 81° 39' E
21	24S	13W	SW12	N 7° 12' E	2632	N 21° 42' E
22	24S	13W	SW12	N 18° 54' E	2632	N 38° 51' W
23	24S	13W	SW 1	N 46° 02' E	3190	N 39° 36' W

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, Central Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
WAH WAH VALLEY, UTAH
CLUSTER 5

Being 23 parcels in the County of Millard, State of Utah, each having the shape and dimensions as shown on Attachment No. 1, situated as shown with cadastral ties in the tabular form below:

Shelter Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through Shelter
	Township	Range	Section Corner	Bearing	Distance	
1	25S	13W	NE28	S 17° 05' W	2167	S 39° 10' W
2	25S	13W	SW21	N 47° 49' E	3754	N 81° 04' W
3	25S	13W	SW15	N 21° 37' E	1474	N 41° 25' W
4	25S	13W	NW14	S 3° 03' E	1977	S 26° 22' W
5	25S	13W	SW10	N 46° 59' E	3497	S 86° 11' W
6	25S	13W	SW 1	N 81° 20' E	1722	N 72° 00' E
7	24S	13W	SW35	N 72° 50' E	1418	N 17° 03' E
8	24S	13W	NE35	S 0° 21' E	1272	N 18° 04' W
9	24S	13W	SE25	N 35° 22' W	931	S 47° 53' E
10	24S	12W	SW19	N 45° 18' E	697	N 72° 31' E
11	24S	13W	NW24	S 52° 25' E	2490	N 12° 18' E
12	24S	12W	NW19	S 82° 34' E	3391	N 27° 06' W
13	24S	12W	NW21	S 71° 33' W	2070	N 32° 41' E
14	24S	12W	SE21	N 79° 43' W	4036	S 27° 36' W
15	24S	12W	SW22	N 60° 24' E	1320	S 32° 20' E
16	24S	12W	SE16	S 82° 39' E	4194	N 25° 07' W
17	24S	12W	SE24	S 82° 39' E	8051	N 35° 25' E
18	24S	12W	NE25	S 55° 40' W	3132	S 32° 00' E
19	24S	12W	NW33	N 70° 50' E	1844	N 50° 35' W
20	24S	12W	SE34	N 71° 06' E	3541	N 69° 10' E
21	25S	12W	NE 3	S 57° 32' W	1452	S 51° 45' E
22	24S	12W	SW33	N 64° 14' E	1112	S 69° 31' W
23	25S	12W	NE 4	S 13° 09' W	2677	S 10° 48' W

Area of each parcel is 2.49 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, Central Zone.
Distances shown are ground level in feet.

MX SITING PROJECT
WAH WAH VALLEY, UTAH
CMF's

Being 2 parcels in the County of Beaver, State of Utah, each having the shape and dimensions as shown on Attachment No. 2, situated as shown with cadastral ties in the tabular form below:

CMF Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through CMF
	Township	Range	Section Corner	Bearing	Distance	
1	27S	14W	SW24	N 68° 00' E	2100	S 8° 30' E
2	26S	14W	NE12	S 53° 00' W	2350	S 18° 52' W

Area of each parcel is 4.25 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, South Zone.
Distances shown are ground level in feet.

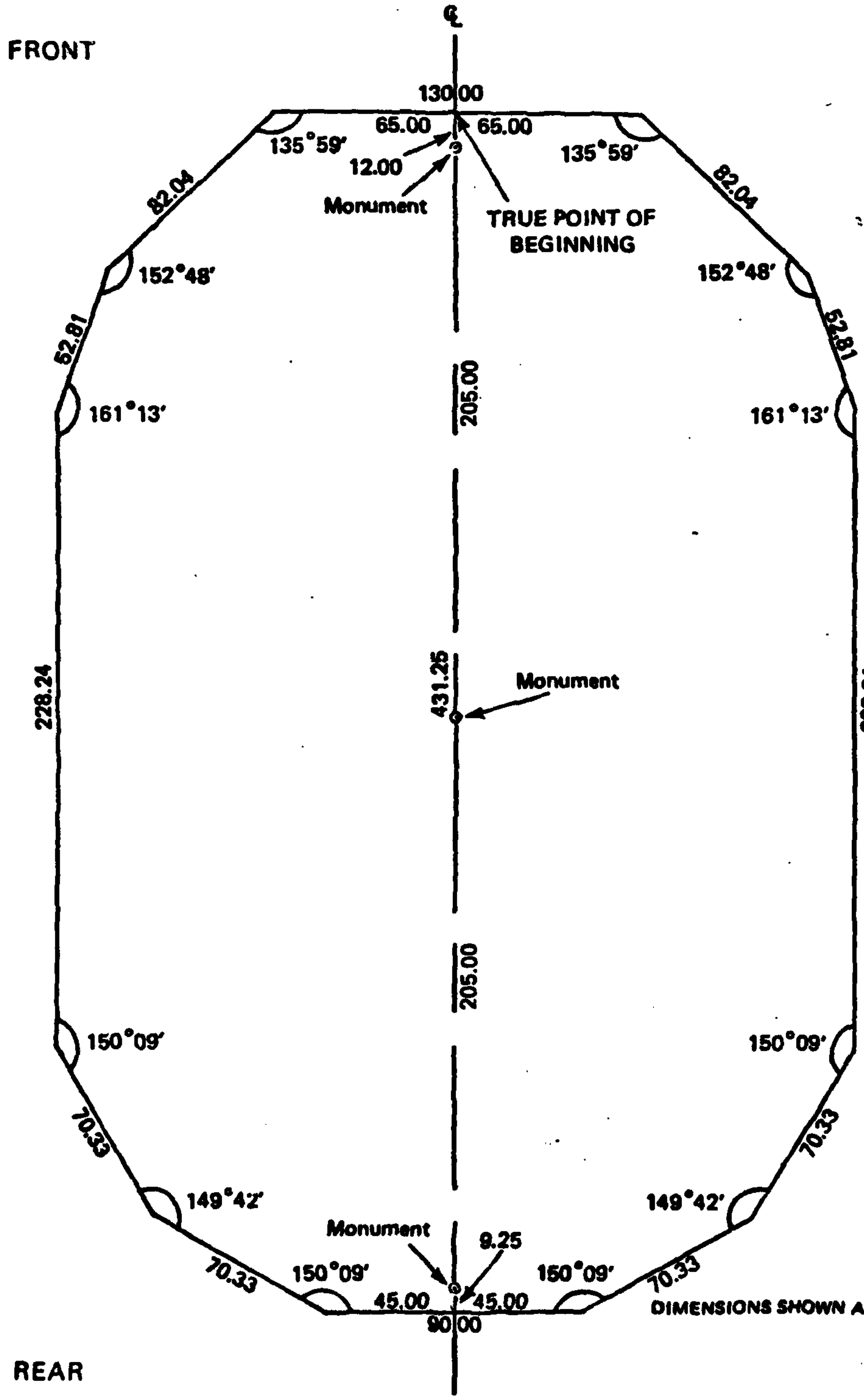
MX SITING PROJECT
WAH WAH VALLEY, UTAH
CMF's

Being 3 parcels in the County of Millard, State of Utah, each having the shape and dimensions as shown on Attachment No. 2, situated as shown with cadastral ties in the tabular form below:

CMF Number	Cadastral Reference Point			Tie to True Point of Beginning		Center line Bearing from True POB through CMF
	Township	Range	Section Corner	Bearing	Distance	
3	25S	14W	NE14	S 53° 40' W	5450	N 74° 55' E
4	24S	13W	SW15	N 26° 30' E	1800	S 60° 01' E
5	24S	12W	SW19	N 58° 30' E	3600	S 45° 05' E

Area of each parcel is 4.25 acres, more or less.
Bearings shown are on the Utah State Plane Coordinate System, Grid North, Central Zone.
Distances shown are ground level in feet.

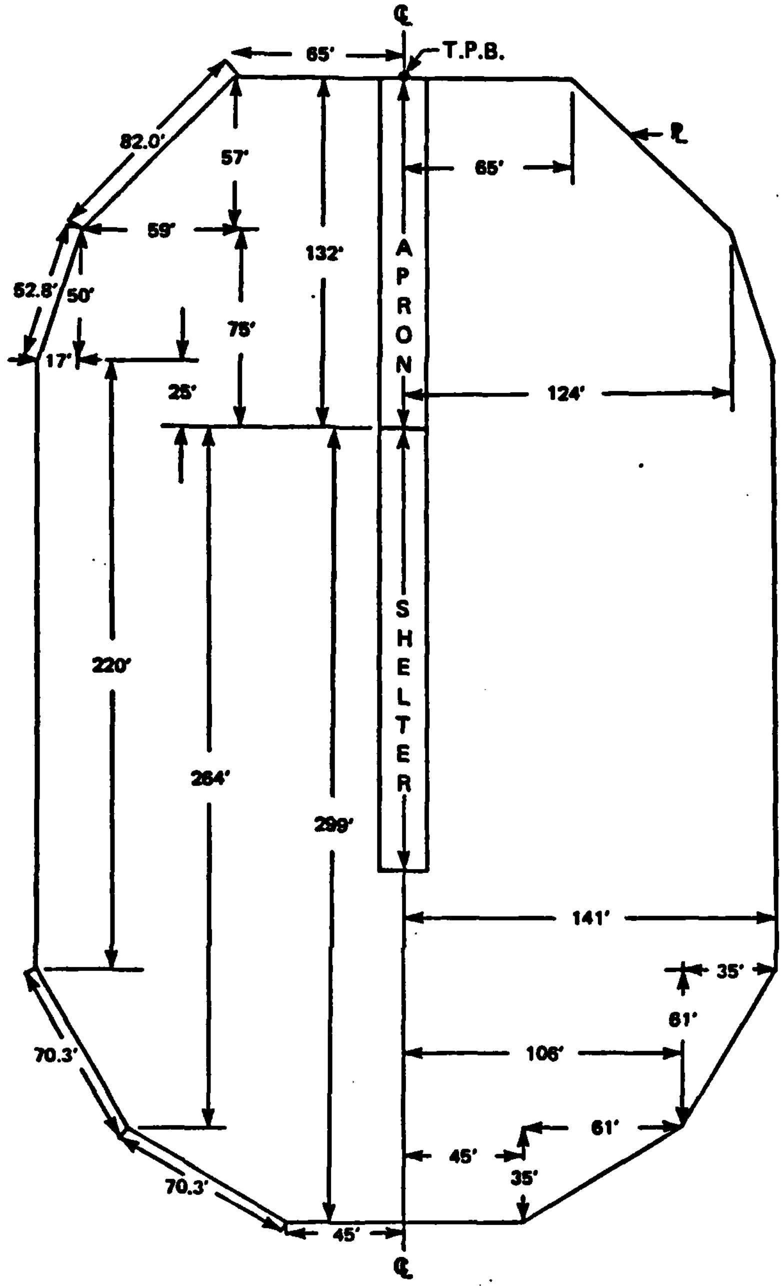
ATTACHMENT I



PERIMETER = 1227.50
NET AREA = 2.4964 ARCRES

DIMENSIONS SHOWN ARE GROUND LEVEL IN FEET.

HORIZONTAL SHELTER SITE LAYOUT

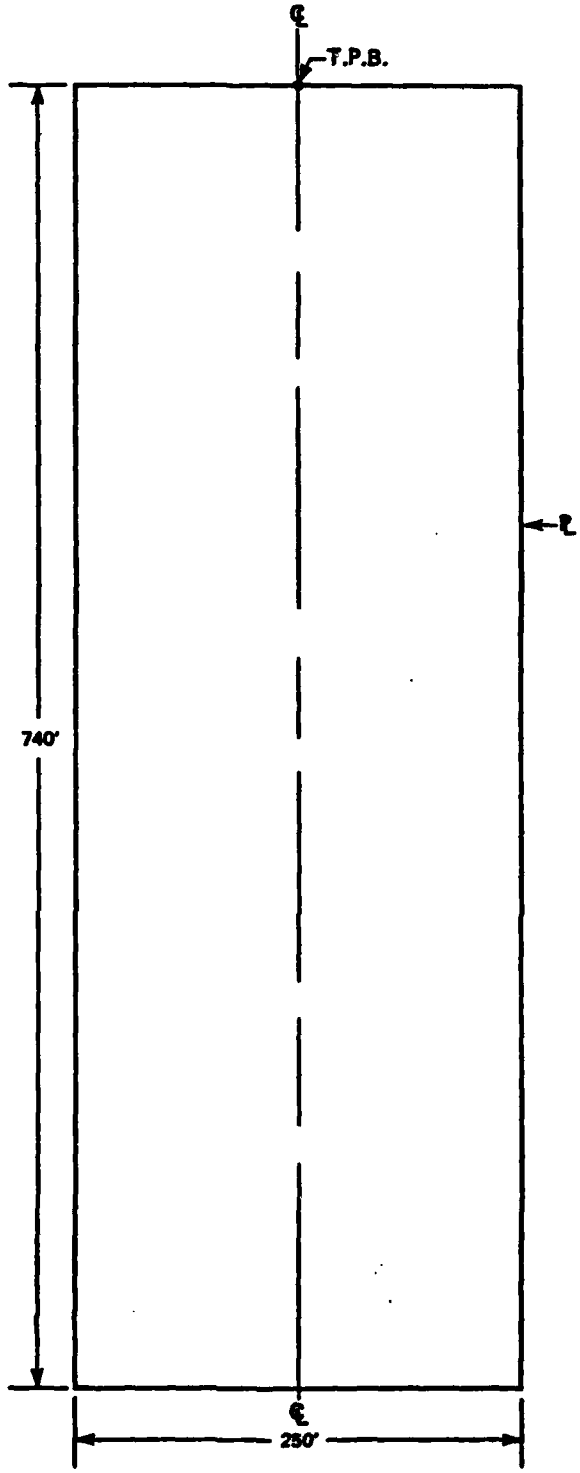


PERIMETER 1227.3 FT.
AREA 108,741 SQ. FT.

NOTES: 1) T.P.B. = TRUE POINT OF BEGINNING, ℄ = CENTER LINE, ℄ = PROPERTY LINE.
2) EACH PARCEL IS SURROUNDED BY A FENCE, LOCATED ON PROPERTY LINE DEFINED BY THE DODECAGON SHOWN ABOVE. THE DIMENSIONS (DISTANCES) OF THE DODECAGON ARE IDENTICAL FOR ALL LOCATIONS.
3) THE BEARING OF EACH TANGENT ON PROPERTY LINE IS NOT SHOWN. THE BEARING OF EACH TANGENT IS VARIABLE FOR EACH SHELTER.
4) THE TABULATED DATA DEFINES THE BEARING OF EACH ℄ FOR EACH PARCEL.

HORIZONTAL SHELTER SITE SKETCH

ATTACHMENT 2



PERIMETER 1980 FT.
AREA 185,000 SQ. FT.

NOTES: 1) T.P.B. = TRUE POINT OF BEGINNING, ℄ = CENTER LINE, ℘ = PROPERTY LINE.

2) EACH PARCEL IS SURROUNDED BY A FENCE, LOCATED ON PROPERTY LINE DEFINED BY THE RECTANGLE SHOWN ABOVE. THE DIMENSIONS (DISTANCES) OF THE RECTANGLE ARE IDENTICAL FOR ALL LOCATIONS.

3) THE BEARING OF EACH TANGENT ON PROPERTY LINE IS NOT SHOWN. THE BEARING OF EACH TANGENT IS VARIABLE FOR EACH CMF.

4) THE TABULATED DATA DEFINES THE BEARING OF EACH ℄ FOR EACH PARCEL.

CLUSTER MAINTENANCE FACILITY SKETCH

APPENDIX H

STATE SITING REVIEW FIELD TRIP
SNAKE AND TULE VALLEYS - 20 August 1981

DEPARTMENT OF THE AIR FORCE
REGIONAL CIVIL ENGINEER - MX (AFESC)
NORTON AIR FORCE BASE, CA 92409

28 AUG 1981

REPLY TO ATTN OF: DEVC

SUBJECT: Trip Report (Snake and Tule Valleys - 20 August 1981)

TO: DEVC
DEV
DEE
CV
CC
IN TURN

1. On 19 and 20 August 1981, the following individuals traveled to Snake and Tule Valleys in Utah:

Major Michael Elliott	AFRCE-MX/DEVC
Bob Staron	TRW (Siting)
Fred Snyder	ERTEC Western (Siting Manager)
Edd Joy	ERTEC Western (Geographer)
Jerry Thiem	ERTEC Northwest (Botanist)
Rosie Thompson	HDR (Wildlife Biologist)

2. The trip was planned in response to specific concerns raised by the Utah M-X Coordinating Office regarding proposed shelter sitings in Snake Valley and the proposed Area Support Center (ASC) location in Tule Valley. Dr. Paul Cox (Utah M-X Coordinating Office) had made field trips to these valleys in July and August. The first of these field trips resulted in a letter from the Utah M-X Coordinating Office (31 July 1981) in which Dr. Cox expressed concerns about the environmental sensitivities at Skunk Springs which is two miles from the proposed Tule Area Support Center and at Painter Springs which is 12 miles away. The letter concluded that the Air Force surveys failed to reveal the significance of these features, thereby invalidating the M-X siting methodology. Dr. Cox's second field trip to Snake Valley raised the concern that proposed shelter sites (as shown in the 15 May 1981 shelter layouts) had placed shelters on several parcels of irrigated farmland and on the West Desert High School; further proof of the inadequacy of the siting methodology. After several phone conversations regarding the proposed sitings we agreed that an overflight of Snake and Tule Valleys followed by a ground tour would enable us to help resolve the concerns raised by Dr. Cox.

3. On 19 August, we departed Long Beach Airport and made an initial flyover of Snake Valley in a Piper Nahavo chartered by ERTEC. After a brief RON in Delta, Utah, we picked up Dr. Cox and Ann Keegan at the Delta Airport at 0730 on 20 August. We then conducted a two and a half-hour flyover of ?

Snake and Tule Valleys in an attempt to ground-truth the 15 May siting layouts. The flyover was followed by a ground tour of the specific areas of concern observed in the air.

4. The findings from the flyover and ground tour were:

a. No shelters were sited on cropland (irrigated or otherwise). There are several shelters sited within half-mile of cropland. Though this is within the Air Force criteria, we agreed after looking at the layouts that improvements could be made by resiting these shelters farther away, thereby reducing encroachment on the property owner and allowing room for future expansion. As a result, we agreed to relocate shelters 13-11, 13-12, 16-5, 16-4, 13-10, 13-9, 9-23, 9-22, 5-23, 9-1, 11-3, and adjust dusters as necessary in the relocation process.

b. The shelter thought to be very near West Desert High School (shelter site 16-5) is actually about 1.5 miles away. Though this may seem close, the Air Force criteria for standoff distance from a town of 5,000 or less is one mile, so this is well within the Air Force criteria. The high school is a very small high school in a remote location. The required standoff distance is 2,965 feet. The overflight helped clarify that the sitings in relation to the location of the high school are adequate and within Air Force criteria.

c. Shelter sites 16-17, 16-14, and 16-13 near Trout Creek should not be a problem to activity in the creek in that region as claimed by Utah. Though the headwaters of Trout Creek contain some endangered fish (Utah cutthroat trout), the portion of the creek in the siting area is actually a long straight cement irrigation culvert several miles long. Rosie Thompson, an Aquatic Biologist from HDR, inspected the area and felt that shelter sites which would require crossing the creek should pose no environmental problem to use of the creek. Dr. Cox's concern that several sites had been sited in the creek (i.e., submersible sites) was indeterminable on the map because the precise location of the creek was not shown. We pointed out that at the next level of siting (i.e., 1:9600 scale maps), the exact relationships of shelters to the creek would be resolved. ERTEC volunteered to rework the preliminary sitings in the area to avoid crossing the creek, if possible.

d. DTN routings that were a concern to Utah included an intersection near the Robinson's ranch, several other inhabited buildings and the route through the town of Garrison. The DTN had been sited to follow the existing road in west Snake Valley. As a result, it appeared to run through a number of pieces of private land, and in the town of Garrison it actually shows a DTN crossing over a center pivot irrigation system. ERTEC agreed to rework that siting to clearly follow the road. Utah asked that the main DTN be sited several miles east to avoid impact to the area that is currently under cultivation. After some discussion, Utah agreed to withhold a routing recommendation until after having consulted with the residents of the valley who could be very much affected by the position of the DTN. Utah invited an Air Force siting representative to participate in discussions with residents of the valley which are planned in FY 82 as part of the Utah siting review process. We jointly agreed to leave the DTN siting as it is pending Utah's formal input.

e. Shelter sites 9-26, 9-27, 9-18, 9-21, and 9-24 were originally thought to be too close to a 230 KV Sierra Pacific Power corridor. The flyover clarified that the sitings had in fact observed the proper stand-off distance.

f. The flyover of the Area Support Center in Tule Valley shows it to be about two to two and a half miles from Skunk Springs. The spring is a cattle watering trough used by cattle and by other wildlife, including a large antelope herd in the south part of the valley. On three separate occasions this year, the DTN/ASC siting team visited Skunk Springs. In their opinion, the ASC location over two miles away (and not in sight of the watering tank, because of a range of hills in between) should not be a problem to the use of the spring as a water source. Utah's concern is that personnel from the ASC would disturb the use of the springs while off duty. While we concurred in general, we maintained that siting the ASC 3, 4, 5 or more miles further away would not significantly alter the disturbance, and the very presence of an ASC in a valley would affect all the significant features of the valley. It was pointed out that the proposed ASC location met all Tier 1 criteria and was found to be an acceptable site. In fact, Tule Valley is quite barren and the siting of the ASC was thought to have minimal adverse impacts.

g. A ground tour of Painter Springs, about 12 miles from the proposed Tule ASC and about four miles from the nearest proposed clustering, shows that this spring is a relatively undisturbed, typical desert spring area. The species found there are typical of many other similar desert springs. At the Tier 1 level, there is no reason to observe special standoffs for this area (i.e., Tier 1 sitings meet all criteria). However, in recognition of Utah's concern we pointed out to Ann Keegan and Dr. Cox that if the state finds the Painter Springs region to be an important environmental asset (that is sufficiently important to site the Area Support Center in another valley), the state should include this in their formal comments on the siting drawings and we would consider alternate sites in Snake Valley or Whirlwind Valley for the ASC. Tule Valley is a very barren, dry, untouched desert region. In fact, it is so remote that we probably should resite the ASC closer to an existing community for reasons other than Painter Springs. It was pointed out to Utah that Tier 2 environmental studies have not yet been performed in Tule Valley and neighboring valleys. The Tier 2 studies will address the significance of areas like Painter Springs and may in fact result in changes of Tier 1 siting proposals.

5. Several other findings of the trip are worth noting:

a. The siting methodology at the Tier 1 level (i.e., 1:62500 scale layouts) is working well contrary to Dr. Cox's conclusion. However, we need better land status data. The data currently used is from the Corps of Engineers real estate planning reports and is unrefined and out of date. The farmland

and ownership boundaries change constantly and the high school is new. Without accurate land status data, we will make unknowing siting errors. Snake Valley is an example of how the boundaries have changed since the real estate planning report, and if we had mistakenly sited on the high school, it could have been an embarrassment. I attempted to fund ERTEC in FY 81 to update the land status data and was advised that this was a Corps of Engineers responsibility. I personally feel that this is the responsibility of the siting contractor and recommend we fund ERTEC in FY 82 (approximate cost is $200K for a thorough update including cartography).

b. An important part of the siting methodology is the interchange with the states. Their input in many areas is valid. Their view of the sensitivity of the Tule ASC, though a different perspective than my own, is worth considering. If we can find an equally acceptable ASC site in another valley, and if such is the state's recommendation, we should do it. In the long run, we'll have a better site. In Snake Valley, the interchange in the field with Dr. Cox resulted in a revised siting proposal that is significantly improved and is something the state can live with.

c. Snake Valley demonstrated the need to field verify the layouts at the 1:62500 stage. If we had perfect land status data, this wouldn't be necessary. ERTEC planned the field verifications of the layouts prior to the 1:9600 layout stage. However, Snake Valley has shown it should be done during the review of the 1:62500 layout.

d. The use of backfill sites to minimize the impact on high value land areas (such as wet farming areas, regions near mining areas, or high value wildlife areas such as water holes) is a good mitigation tool. Simply site the backfill sites near these areas, with the primary sites farther away. Most people in the program believe that it is unlikely the backfill sites will be filled, so than the net effect is a reduction of direct environmental impact. I've asked ERTEC to look at doing this in certain areas of Snake Valley to see if improvements can be made at no additional cost.

e. The aircraft overflight to ground-truth the sitings is a good way to gain feel for the valley layout, make on-the-spot improvements to the layouts, and add confidence to the product. This should be done for each valley.

6. All objectives of the trip were accomplished. The initial accusations made by the state of Utah regarding siting on farmland and the high school were found to be erroneous. However, the revisions made jointly during the flyover do make significant improvements for the residents of the valley and Dr. Cox's recommendations in making these resitings were most helpful. As a result of the revisions, the Snake Valley layout meets all Tier 1 siting criteria. Ann Keegan was very helpful. Because of the value of this trip, we are planning a similar trip to White River, Lake, Spring, Hamlin, Garden and Coal Valleys in early FY 82 as a part of the joint siting review process with Nevada.

Michael W. Elliott

MICHAEL W. ELLIOTT, Major, USAF
Manager, M-X Siting Program

Cy to: TRW/R. Staron
ERTEC/F. Snyder
BMO/ENB (Lt Col Hickman)

DEVC [illegible]
Comments P[illegible]

UTAH MX COORDINATION OFFICE
448 EAST 400 SOUTH, SUITE 103
SALT LAKE CITY, UTAH 84111
Phone (801) 364-9647

SCOTT M. MATHESON
GOVERNOR

KENNETH C. OLSON
PROJECT MANAGER

July 31, 1981

Colonel William Sims
AFRCE-MX/DEV
Norton Air Force Base, CA 92409

Dear Colonel Sims:

As part of our independent review of the deployment area for the proposed MX-MPS system, I requested Dr. Paul Cox, our staff ecologist, to tour the deployment area in Pine, Wah Wah and Tule Valleys during the week of July 6, 1981. During his trip, Dr. Cox traveled and examined the areas proposed for shelter clusters in Pine, Wah Wah and Tule Valleys in iterations I and II in the siting maps provided by you to our office. As a result of this independent investigation, several important concerns came to light:

1.) There appears to be little rhyme or reason from an environmental viewpoint in the siting of area support centers. For example, the area support center (ASC) in Tule Valley is located only 3.2 kilometers from the single most important wildlife habitat in the valley, Skunk Springs, at which there is extensive antelope usage, raptor usage, and raptor nests, as well as extensive use by livestock. General McCartney has informed us that there would be around 300 people manning the support centers, many of whom would commute to and from the ASC at the hours 0800, 1600 and 2400. The Air Force personnel would stay within the ASC for up to one week and utilize dormitories, dining halls, and recreation facilities. Clearly, such intensive human activity at the ASC is completely incompatible with the critical wildlife and agricultural usage at Skunk Springs. It appears that even a properly designed gross environmental constraint analysis would have revealed this potentially severe conflict.

2.) Dr. Cox discovered that the environmental surveys which the Air Force has transmitted to this state have failed to reveal highly significant biological features in these valleys. For example, at Painter Springs in Tule Valley, Dr. Cox found very sensitive populations of a rare territrial orchid Epipactis gigantea a Dougl. ex. Hook., a native columbine Aquilegia formosa Fisch., and a highly unusual Indian paintbrush Castilleja Sp. as well as cougar tracks, a Desert striped whip snake, a Great Basin goupher snake, whip-tailed lizards, side-blotchlizards, an unusual hybrid cottonwood tree, and wild rose. None of these highly significant biological features were reported in the environmental assessments prepared by the Air Force or their contractors. However, Painter Springs will be potentially severely impacted from the area support center which is located 12 miles to the west and the cluster no. 4 in which shelters 4-10, 4-11, and a cluster maintenance facility are all located within a one-mile radius of the spring. We seriously question the adequacy of your environmental assessments of the deployment area when a very cursory and short inspection by one of our staff members revealed in a few minutes significant biological features which have been unreported and possibly even unnoticed by you or your contractors.

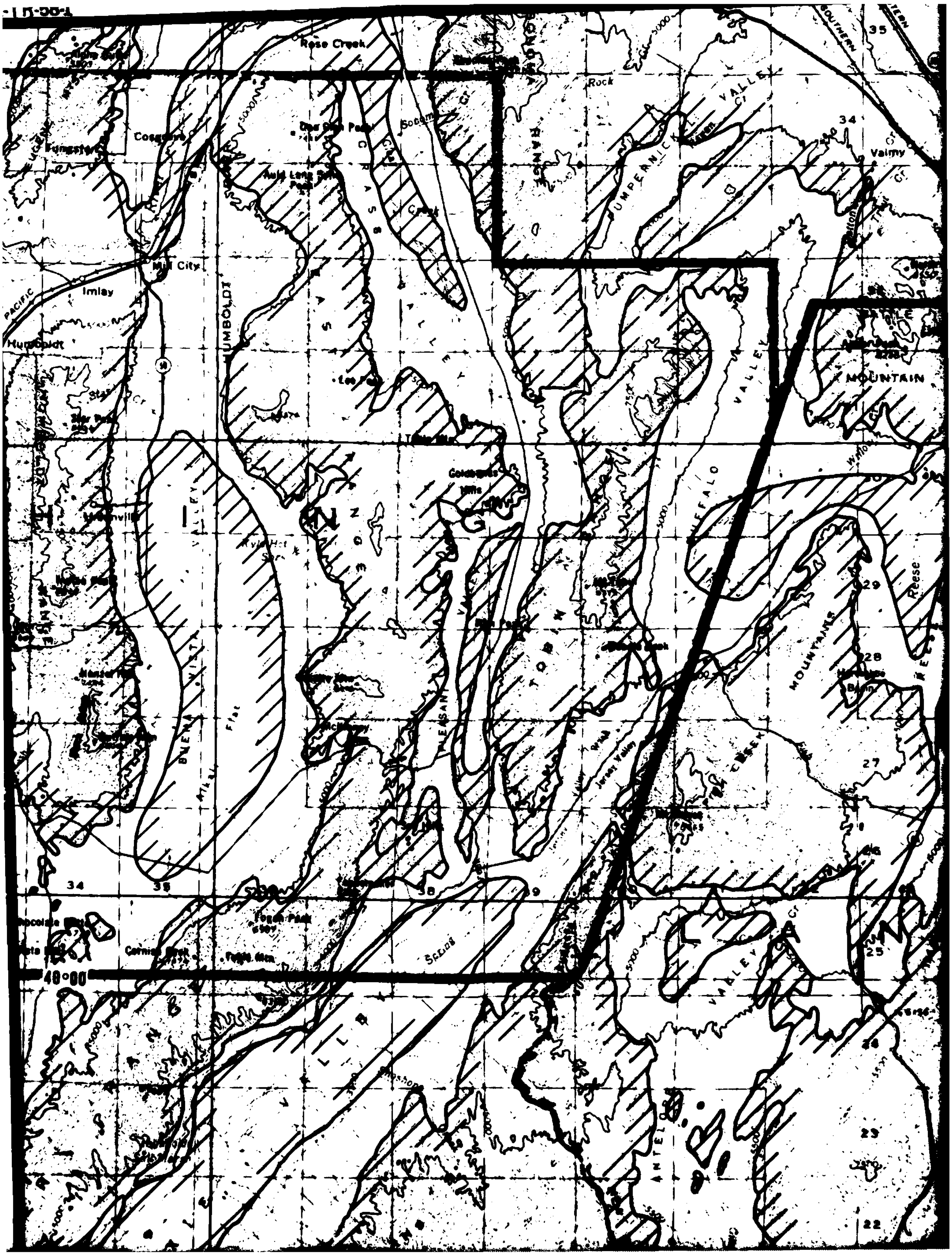
3.) Dr. Cox found in his survey a high degree of environmental heteogenaity between and within valleys. For example, such gross geographic features as topography, water sources, and precipitation varied greatly between valleys; these differences are reflected in the varying mosaics of vegetation, wildlife and agricultural uses. For example, the range in southern Pine Valley and western Tule Valley are composed of a variety of plants which are very valuable to wildlife. Northern Wah Wah has vegetation condusive to grazing while the valley bottom of southern Wah Wah Valley has an extremely poor range. In our opinion, the valleys are not as homogeneous as has been reflected in various environmental documents submitted to the State. Clearly, adequate environmental assessments of the deployment area of Utah will require careful analysis on a valley by valley basis; such an analysis would be useful even at a Tier I level when important regional siting decisions are made.

4.). The importance that water plays in agriculture, mining and wildlife is clear. I am concerned that the Air Force does not completely appreciate the tremendous effort and cost which the farmers and ranchers in these valleys have gone to develop the meager water resources, both surface and subterrain. Workers at the Desert Experimental Station reported to Dr. Cox that the operation of a FUGRO test well resulted in a temporary 12-foot drop in the Desert Experimental Station wells. Any surface water in the valley is almost always associated with intensive agricultural and wildlife usage. The problem of potential disruption of these surface waters through siting, construction activities, maintenance and potential poaching has not, in our opinion, adequately been appreciated by the Air Force. For example, on July 8th, Dr. Cox found at a spring in Pine Valley a golden eagle which had been shot only 15 minutes prior to his arrival. Within a two week period, three golden eagles kills were reported within a five mile radius of the eastern entrance to Pine Valley. Clearly, a few construction workers shooting at a water hole could destroy a major part of the breeding populations of several sensitive raptor species within a few days.

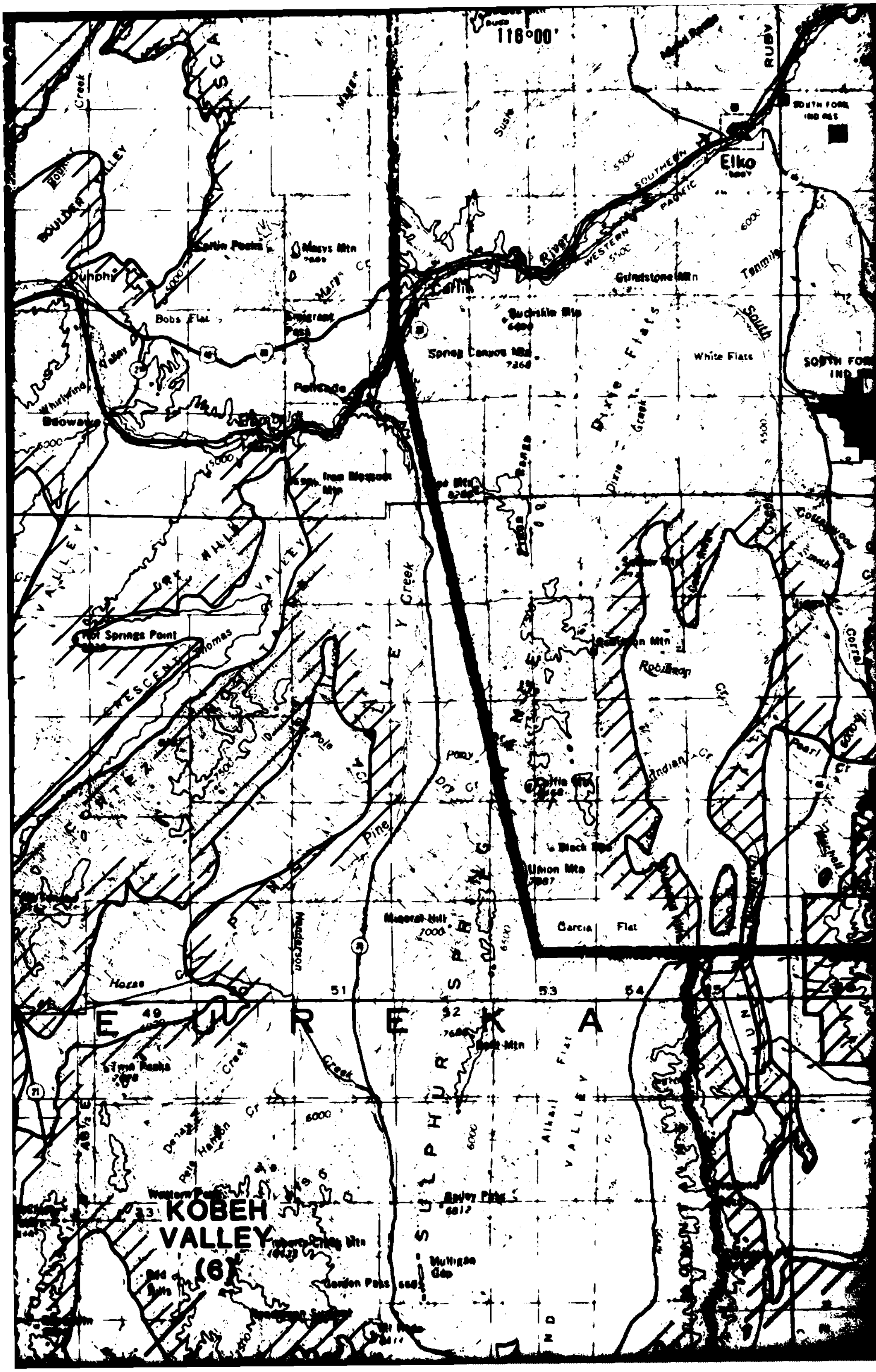
In conclusion, I feel that it is critically important for both the Air Force and the State of Utah to receive accurate, carefully evaluated environmental assessments of the MX deployment area which are based upon state of-the-art scientific methodology and sound statistical sampling designs. I am concerned, however, that neither the State of Utah or the Air Force will be able to adequately fulfill our statutory responsibilities in protecting critical resources unless we work together in raising the level of sophistication of environmental assessments which are currently being performed. Although the time is short for both design and implementation of adequate studies, it is in the best interests of both the Air Force and the State of Utah to have the best environmental information possible concerning the deployment area, so that truly informed decisions can be made concerning the design and deployment of the MX missile.

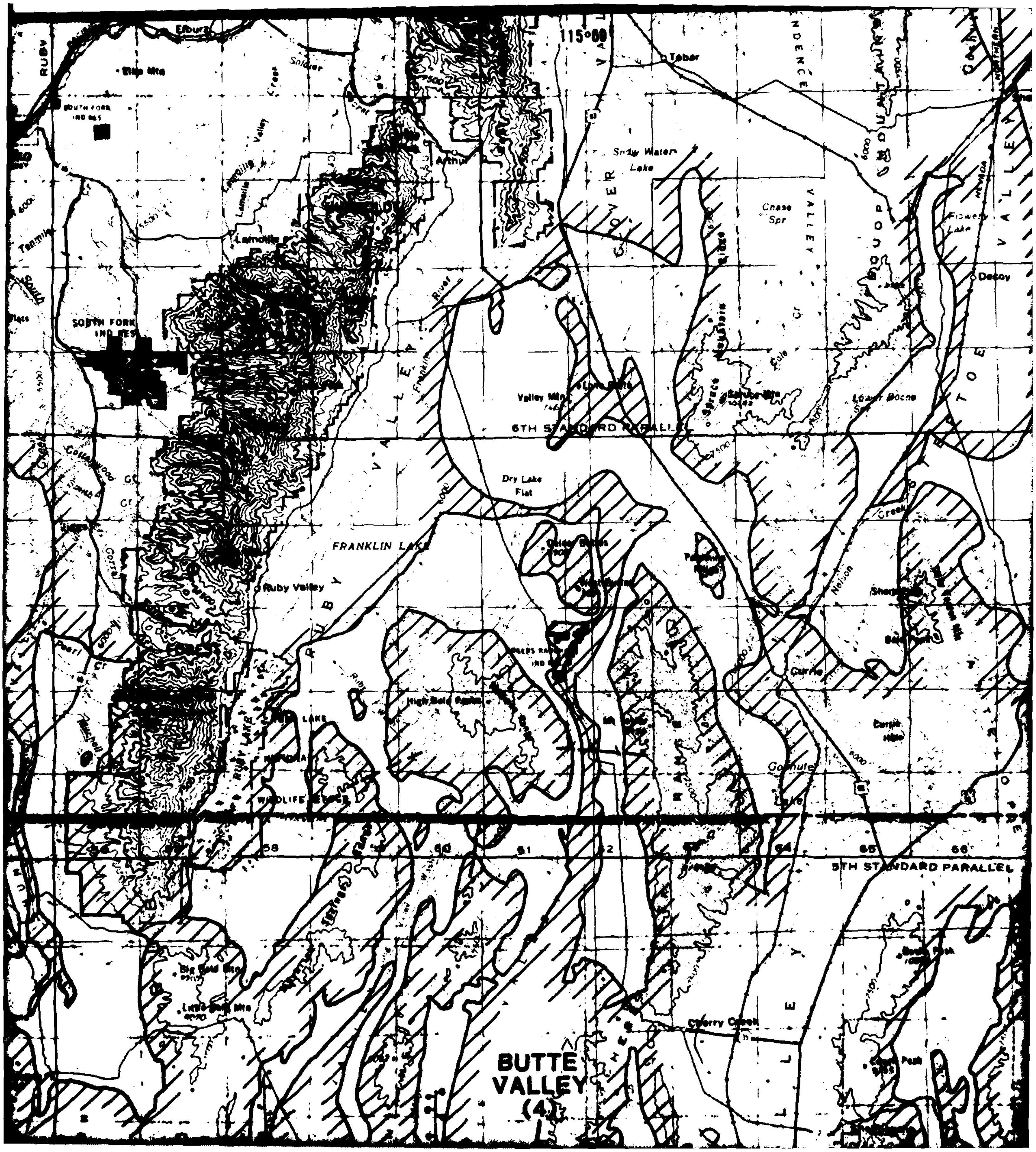
Sincerely,

Kenneth C. Olson
Project Manager

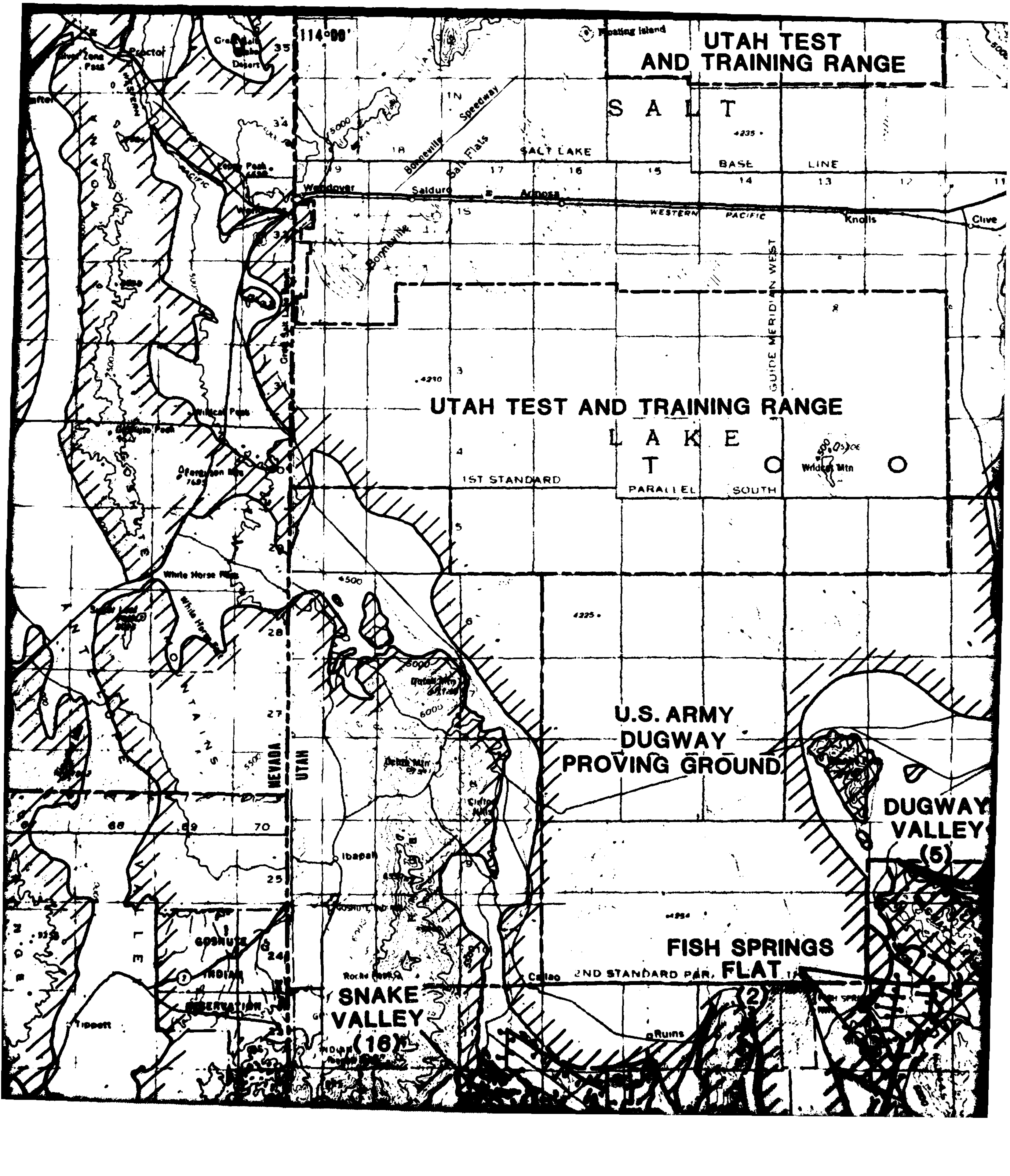


Rose Creek
Cosgrave
Mill City
Imlay
Humboldt
HUMBOLDT
PACIFIC
Rock
Valmy
MOUNTAIN
VALLEY
MOUNTAINS
Reese
Jersey Valley
Flat
34
35
29
28
27
25
23
22

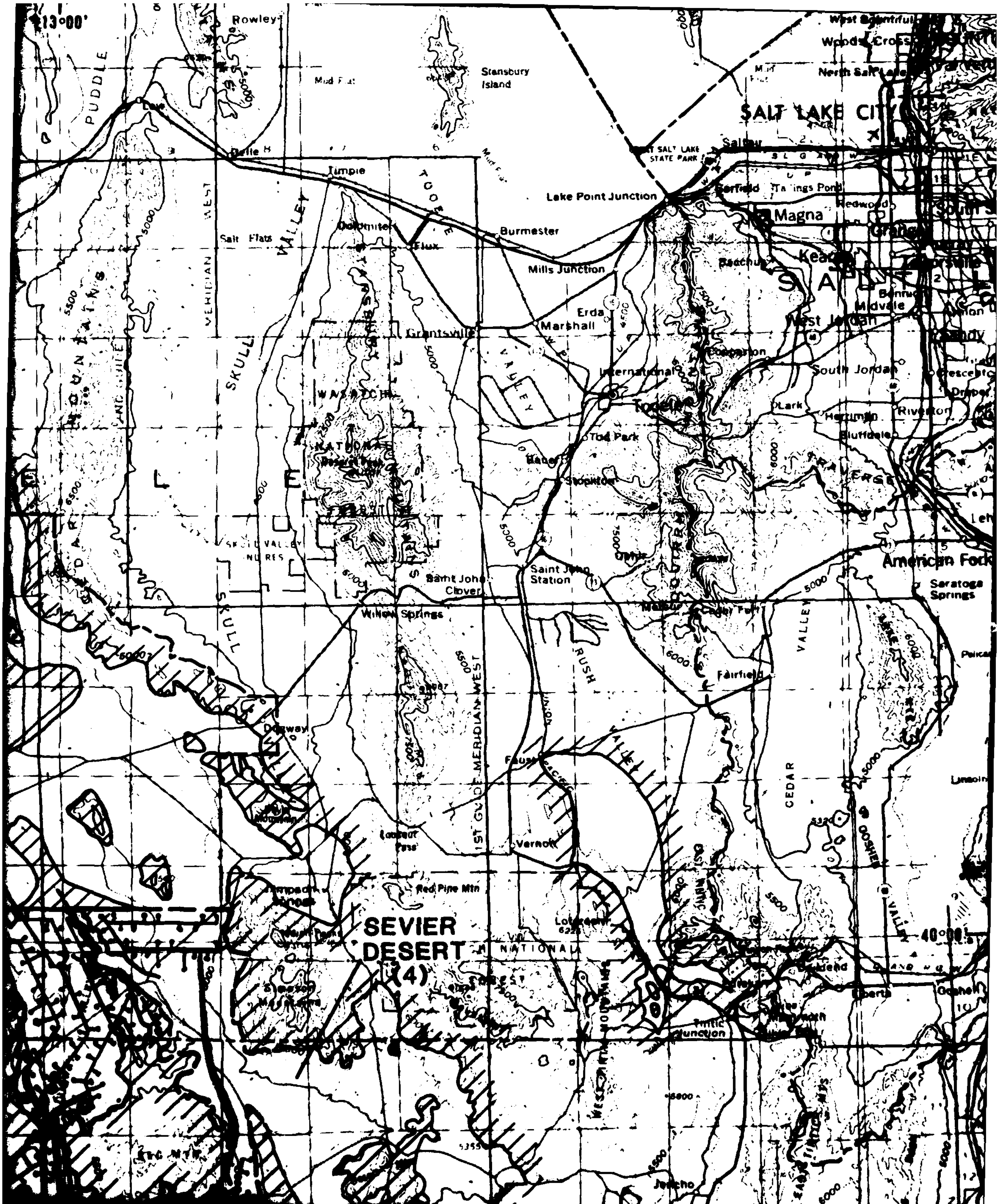

116°00'
Elko
SOUTHERN
PACIFIC
WESTERN
River
Carlin
Grindstone Mtn
Tenmile
White Flats
Dixie Flats
Bobs Flat
Emigrant Pass
Palisade
Beowawe
Whirlwind Valley
Dunphy
Marys Mtn
BOULDER VALLEY
Hot Springs Point
Robinson Mtn
Garcia Flat
Union Mtn
Black Mtn
Pine
Creek
E U R E K A
KOBEH
VALLEY
(6)
Mulligan Gap
Alkali Flat
VALLEY
Horse
Indian Cr
Pearl Cr
Robinson
Dixie Creek
SOUTH FORK IND
SOUTH FORK
Mugeral Hill
Henderson
49
51
52
53
54
55
6000
5500
7000



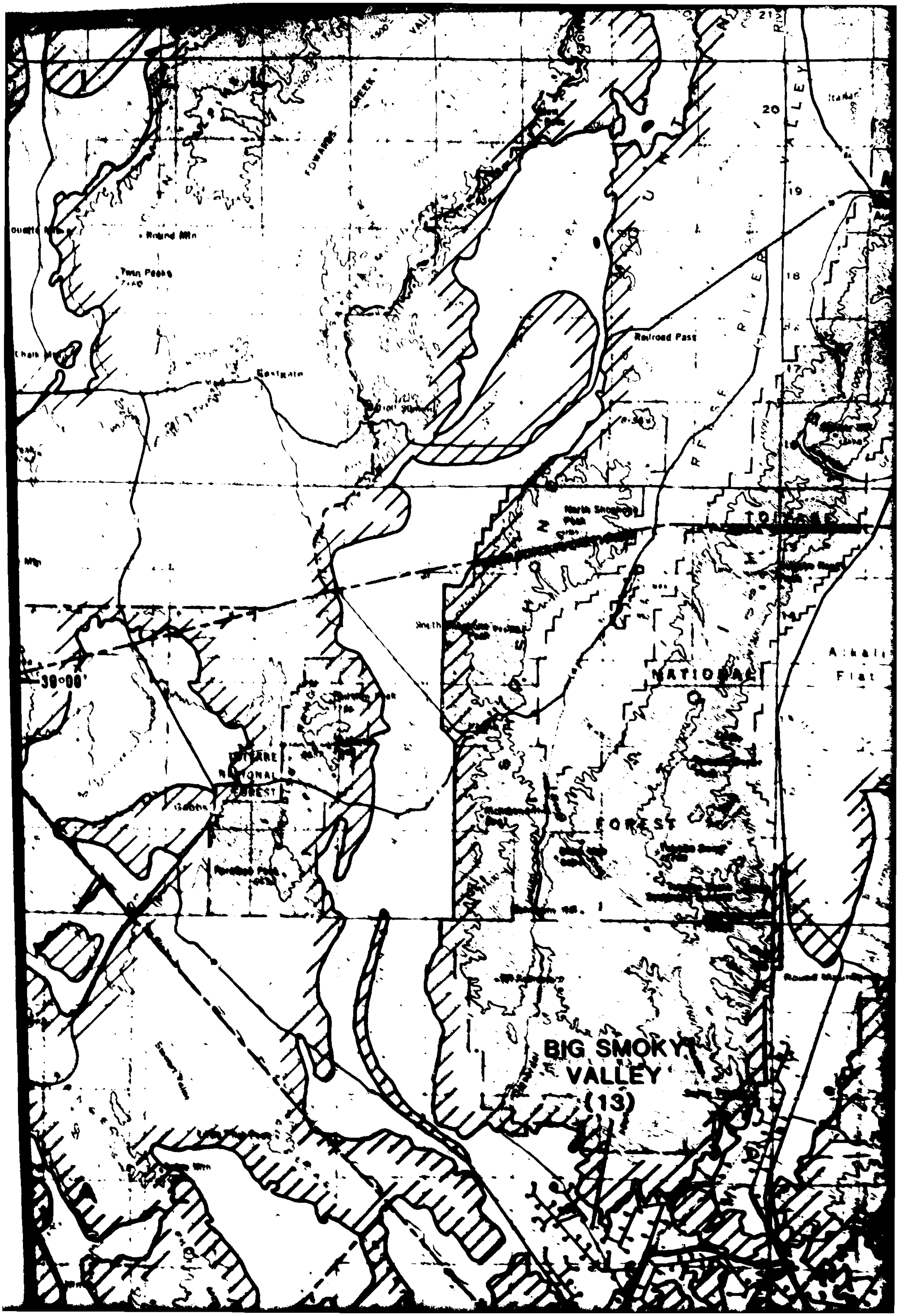
115°00
Elburz
Tabor
Sandy Water Lake
Chase Spr
Decoy
SOUTH FORK IND RES
Lamoille
Valley Mtn
6TH STANDARD PARALLEL
Dry Lake Flat
FRANKLIN LAKE
Ruby Valley
High Bald Peak
RUBY LAKE
WILDLIFE REFUGE
Goshute
5TH STANDARD PARALLEL
Big Bald Mtn
Little Bald Mtn
Cherry Creek
BUTTE VALLEY
(4)



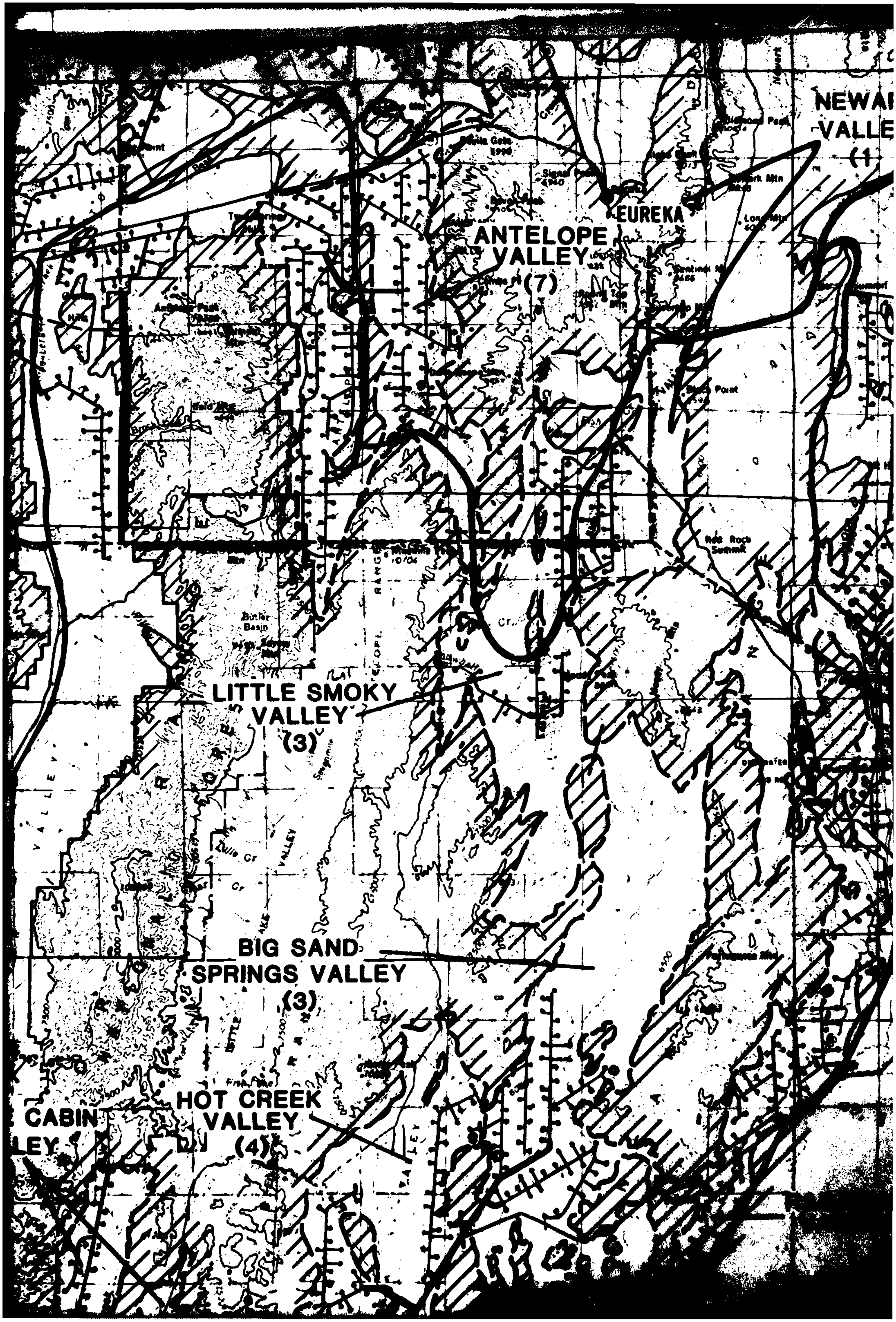
UTAH TEST AND TRAINING RANGE
SALT
SALT LAKE
BASE LINE
Bonneville Salt Flats Speedway
Wendover
Salduro
Arinosa
WESTERN PACIFIC
Knolls
Clive
GUIDE MERIDIAN WEST
UTAH TEST AND TRAINING RANGE
LAKE
TOOO
1ST STANDARD PARALLEL SOUTH
Wildcat Mtn
White Horse Pass
U.S. ARMY
DUGWAY
PROVING GROUND
DUGWAY
VALLEY
(5)
NEVADA
UTAH
Ibapah
GOSHUTE
INDIAN
RESERVATION
Callao
2ND STANDARD PAR.
FISH SPRINGS
FLAT
(2)
SNAKE
VALLEY
(16)
Ruins
Tippett
Proctor

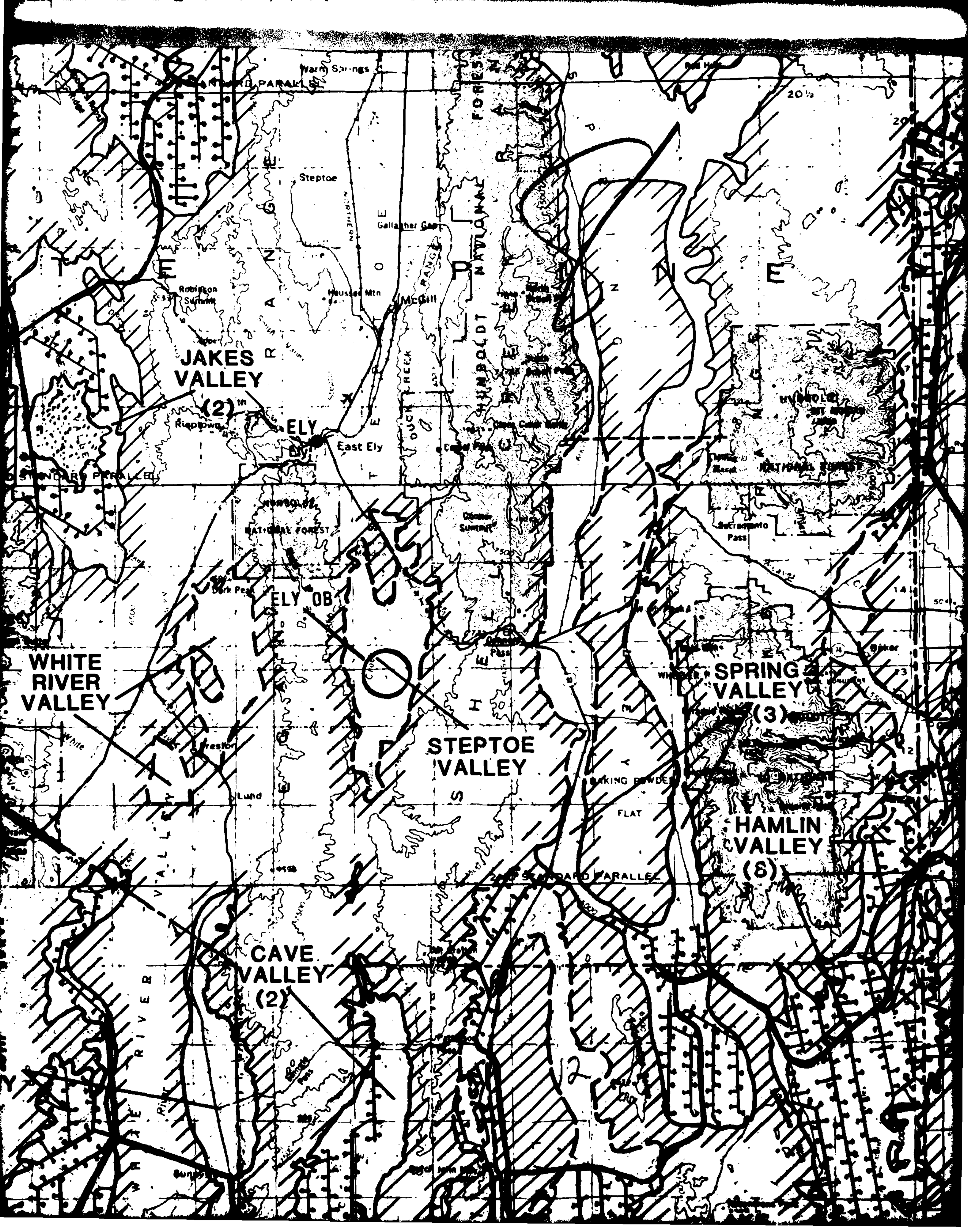


113°00'
Rowley
Stansbury Island
Mud Flat
SALT LAKE CITY
West Bountiful
Woods Cross
North Salt Lake
Saltair
SALT LAKE STATE PARK
Lake Point Junction
Garfield
Magna
Redwood
Kearns
Timpie
Dolomite
Flux
Burmester
Mills Junction
Salt Flats
Erda
Marshall
Grantsville
International
Tooele
Copperton
West Jordan
South Jordan
Midvale
Sandy
Lark
Herriman
Riverton
Draper
Bluffdale
Tod Park
Stockton
American Fork
Saint John Station
Saint John
Clover
Willow Springs
Saratoga Springs
Fairfield
Dugway
Faust
Vernon
Lookout Pass
Red Pine Mtn
SEVIER DESERT
(4)
Jericho
40°00'
Goshen
Elberta
Tintic Junction
CEDAR VALLEY
RUSH VALLEY
SKULL VALLEY
TOOELE VALLEY
1ST GUIDE MERIDIAN WEST
PUDDLE VALLEY
CEDAR MOUNTAINS

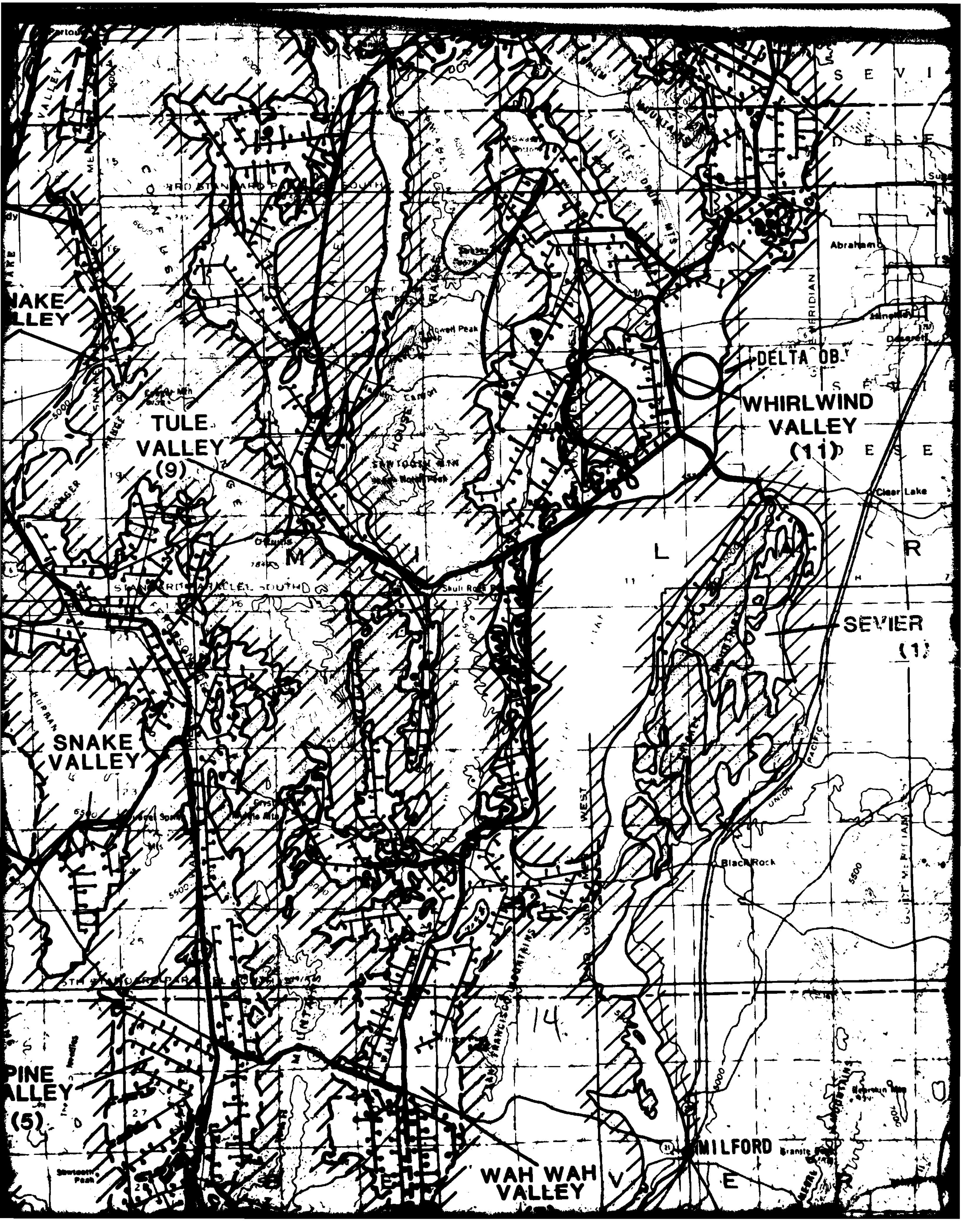


Round Mtn
Twin Peaks
Railroad Pass
NATIONAL
FOREST
TOIYABE
Alkali
Flat
38°00'
BIG SMOKY
VALLEY
(13)

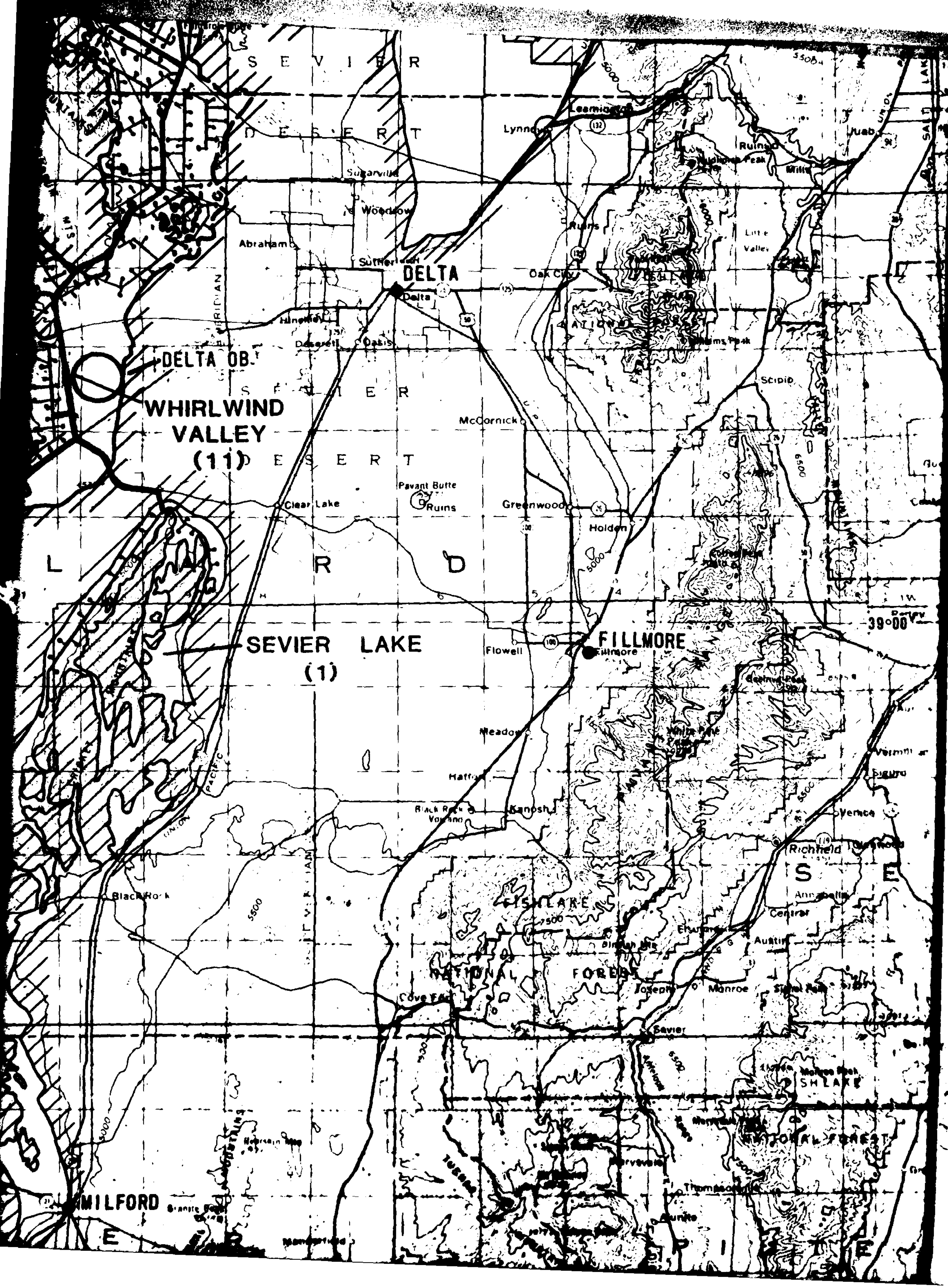

NEWARK VALLEY (1
EUREKA
ANTELOPE VALLEY (7)
LITTLE SMOKY VALLEY (3)
BIG SAND SPRINGS VALLEY (3)
HOT CREEK VALLEY (4)
CABIN
LEY
Red Rock Summit
Butler Basin

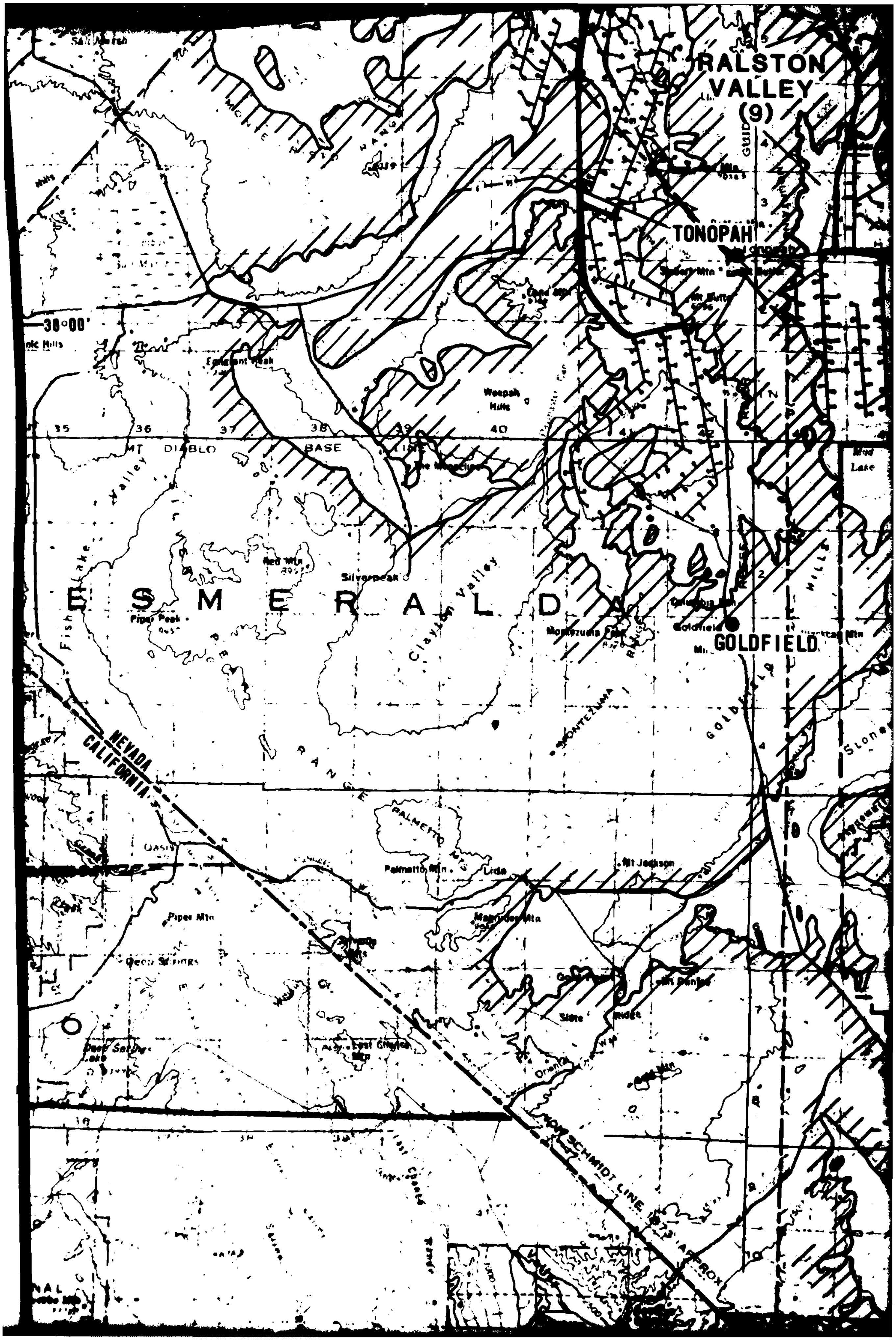


JAKES VALLEY (2)
ELY
East Ely
WHITE RIVER VALLEY
ELY OB
STEPTOE VALLEY
SPRING VALLEY (3)
HAMLIN VALLEY (8)
CAVE VALLEY (2)
Steptoe
McGill
Warm Springs
Lund
Preston
Baker
BAKING POWDER FLAT
NATIONAL FOREST
STANDARD PARALLEL

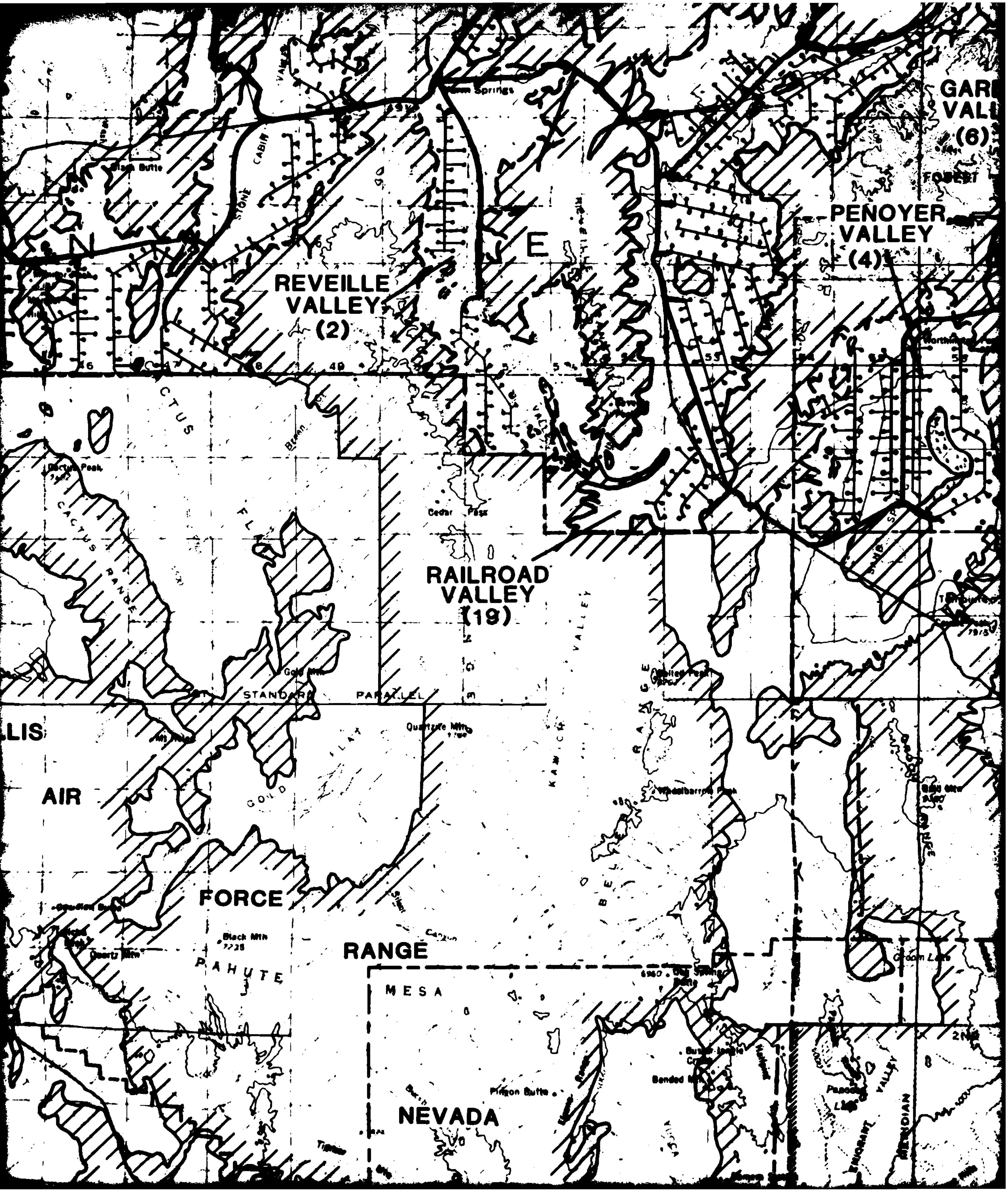


NAKE
LLEY
TULE
VALLEY
(9)
SNAKE
VALLEY
PINE
ALLEY
(5)
DELTA OB.
WHIRLWIND
VALLEY
(11)
SEVIER
(1)
WAH WAH
VALLEY
MILFORD
Abraham
Clear Lake
Black Rock
Deseret
14.

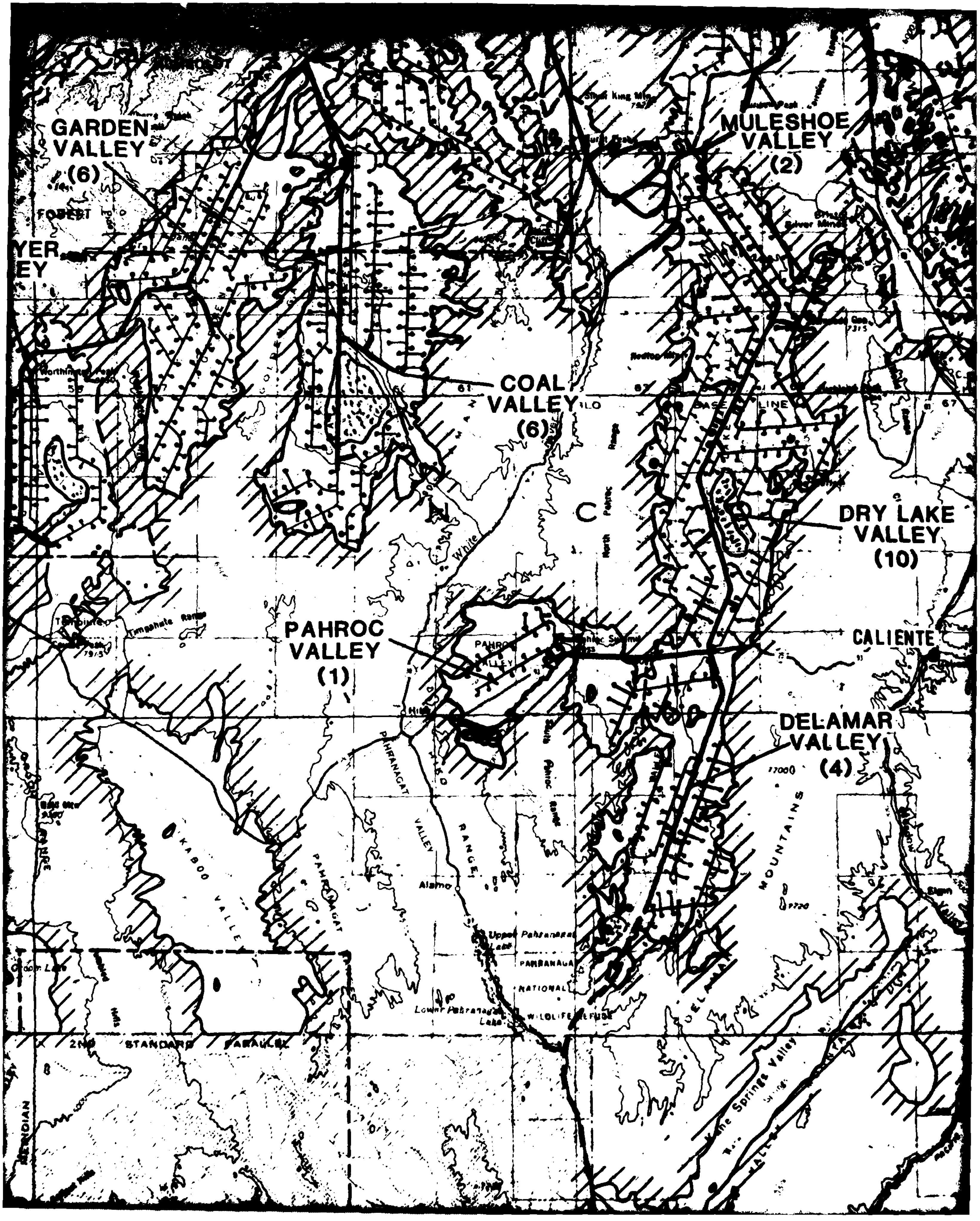

SEVIER DESERT
DELTA
DELTA OB.
WHIRLWIND VALLEY (11)
SEVIER LAKE (1)
FILLMORE
MILFORD
Lynndyl
Leamington
Sugarville
Woodrow
Abraham
Sutherland
Oak City
Hinckley
Deseret
Oasis
McCornick
Clear Lake
Pavant Butte
Ruins
Greenwood
Holden
Scipio
Flowell
Meadow
Hatton
Kanosh
Black Rock Volcano
Black Rock
FISHLAKE NATIONAL FOREST
Cove Fort
Joseph
Monroe
Sevier
Richfield
Venice
Sigurd
Central
Austin
Annabella
Elsinore
Marysvale
Thompsonville
Juab
Mills
Little Valley
39°00'
5500
5000
6500
7500
10

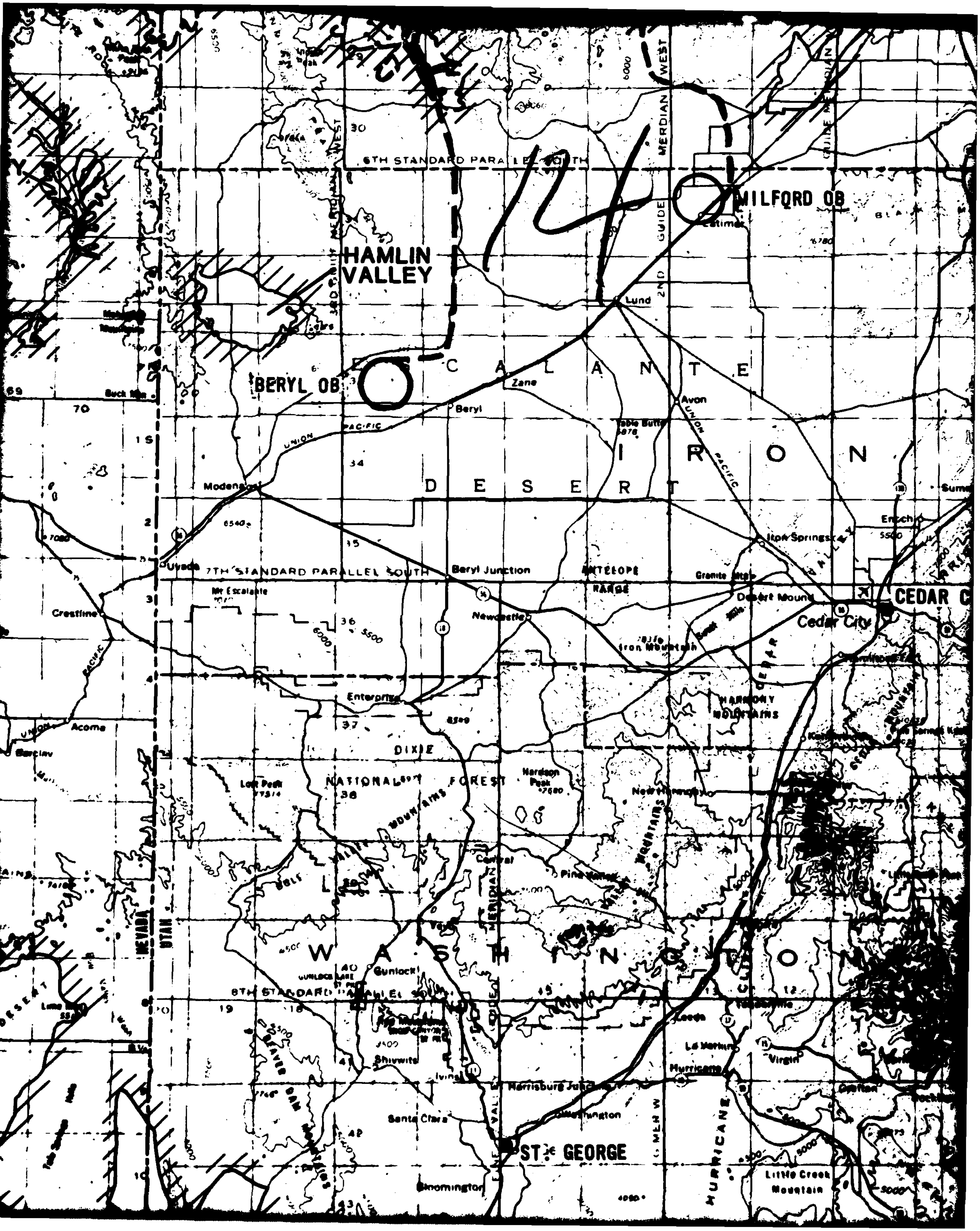


RALSTON VALLEY (9)
TONOPAH
GOLDFIELD
E S M E R A L D A
NEVADA
CALIFORNIA
VON SCHMIDT LINE 1873 (APPROX)
MT DIABLO BASE LINE
38°00'
Weepah Hills
Silverpeak
Clayton Valley
Red Mtn
Piper Peak
Fish Lake Valley
MONTEZUMA RANGE
Montezuma Peak
Columbia Mtn
Goldfield
PALMETTO MTS
Palmetto Mtn
Lida
Mt Jackson
Magruder Mtn
Piper Mtn
Deep Springs
Oasis
Gold Point
Slate Ridge
Oriental Wash
Last Chance Mtn
Mud Lake
Stone
35
36
37
38
39
40
41
42

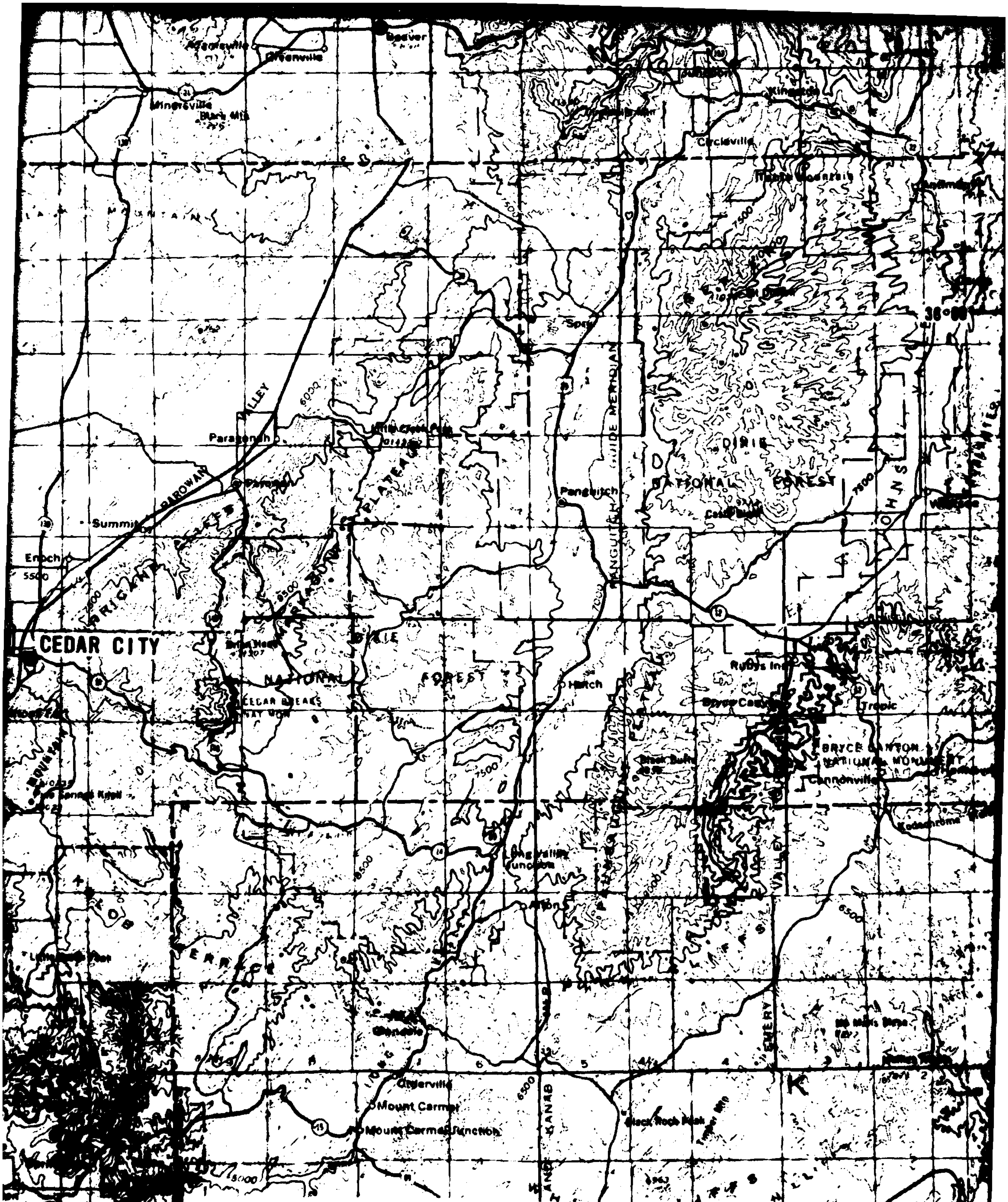


GAR
VAL
(6)
PENOYER
VALLEY
(4)
REVEILLE
VALLEY
(2)
E
RAILROAD
VALLEY
(19)
STANDARD PARALLEL
Cactus Peak
CACTUS RANGE
Cedar Pass
Gold Mtn
Quartzite Mtn
Wheelbarrow Peak
LIS
AIR
FORCE
RANGE
PAHUTE
MESA
NEVADA
Black Mtn
Pinyon Butte
Oak Spring Butte
Banded Mtn
Groom Lake
Warm Springs
Black Butte
STONE CABIN
GOLD FLAT
BELTED RANGE
KAWICH


GARDEN
VALLEY
(6)
MULESHOE
VALLEY
(2)
COAL
VALLEY
(6)
DRY LAKE
VALLEY
(10)
PAHROC
VALLEY
(1)
CALIENTE
DELAMAR
VALLEY
(4)
BASE LINE
MOUNTAINS
RANGE
VALLEY
Alamo
Upper Pahranagat Lake
Lower Pahranagat Lake
PAHRANAGAT
NATIONAL
WILDLIFE REFUGE
2ND STANDARD PARALLEL
MERIDIAN
Kane Springs Valley



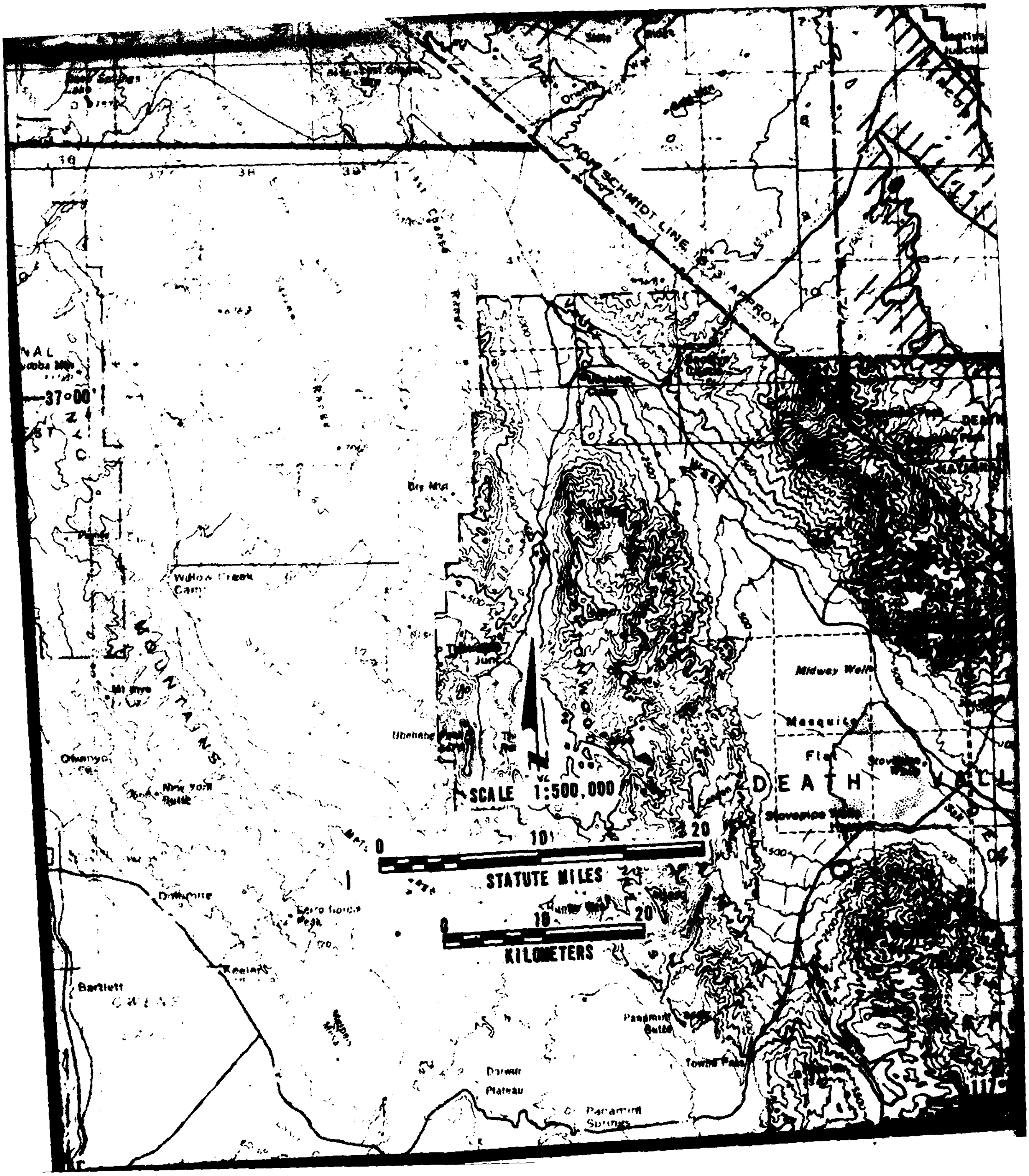
HAMLIN VALLEY
BERYL OB
MILFORD OB
6TH STANDARD PARALLEL SOUTH
7TH STANDARD PARALLEL SOUTH
8TH STANDARD PARALLEL SOUTH
2ND GUIDE MERIDIAN WEST
3RD GUIDE MERIDIAN WEST
E S C A L A N T E
I R O N
D E S E R T
W A S H I N G T O N
Lund
Zane
Beryl
Avon
Modena
Uvada
Crestline
Acoma
Beryl Junction
Newcastle
Enterprise
Iron Springs
Desert Mound
Cedar City
CEDAR C
Granite Mtn
Iron Mountain
ANTELOPE RANGE
HARMONY MOUNTAINS
New Harmony
DIXIE
NATIONAL FOREST
Harrison Peak
Central
Pine Valley
Gunlock
Shivwits
Ivins
Santa Clara
Harrisburg Junction
Washington
ST. GEORGE
Bloomington
Leeds
La Verkin
Hurricane
Virgin
Little Creek Mountain
UNION PACIFIC
NEVADA
UTAH
Enoch
Mt Escalante

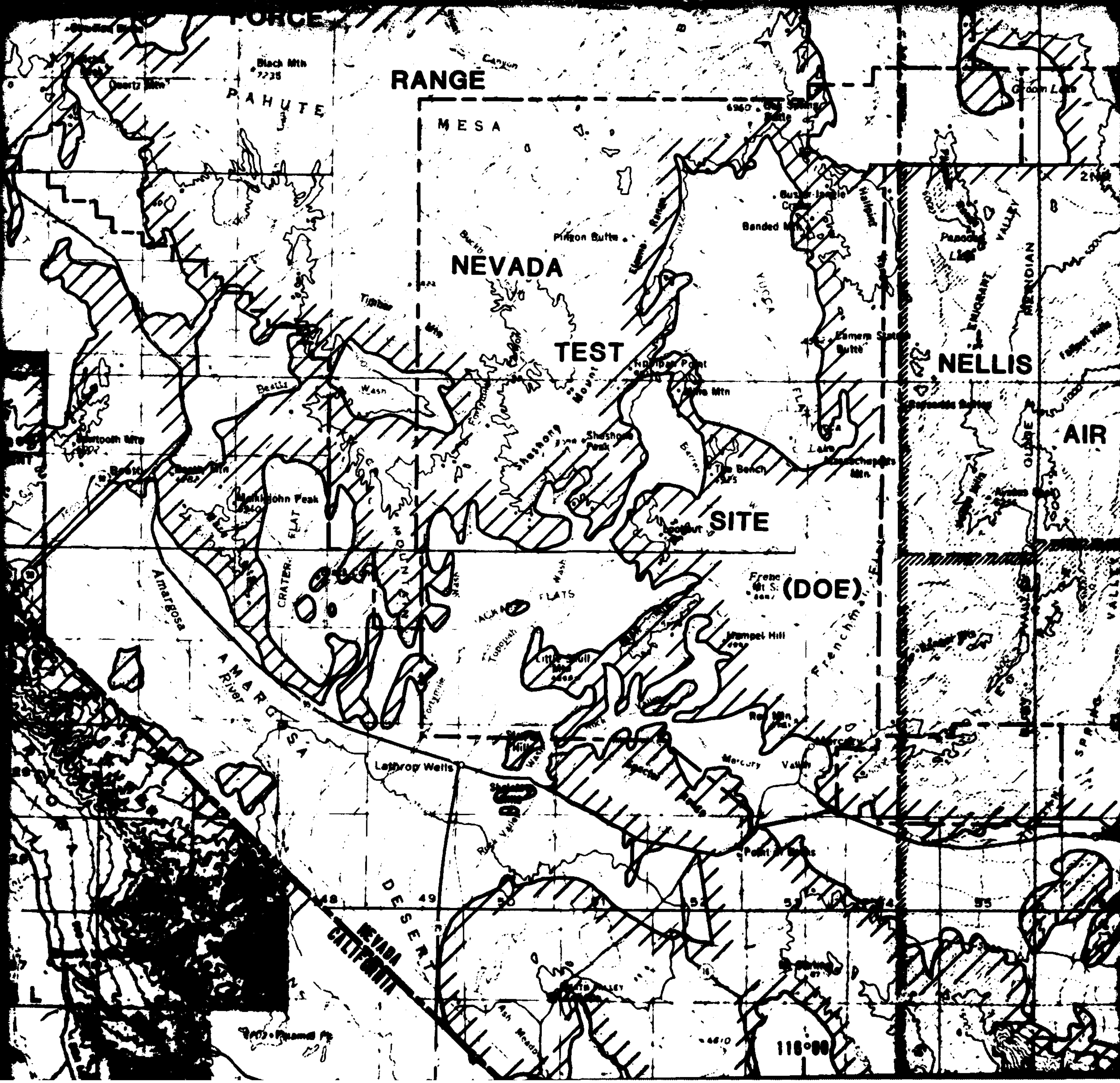


EXPLANATION

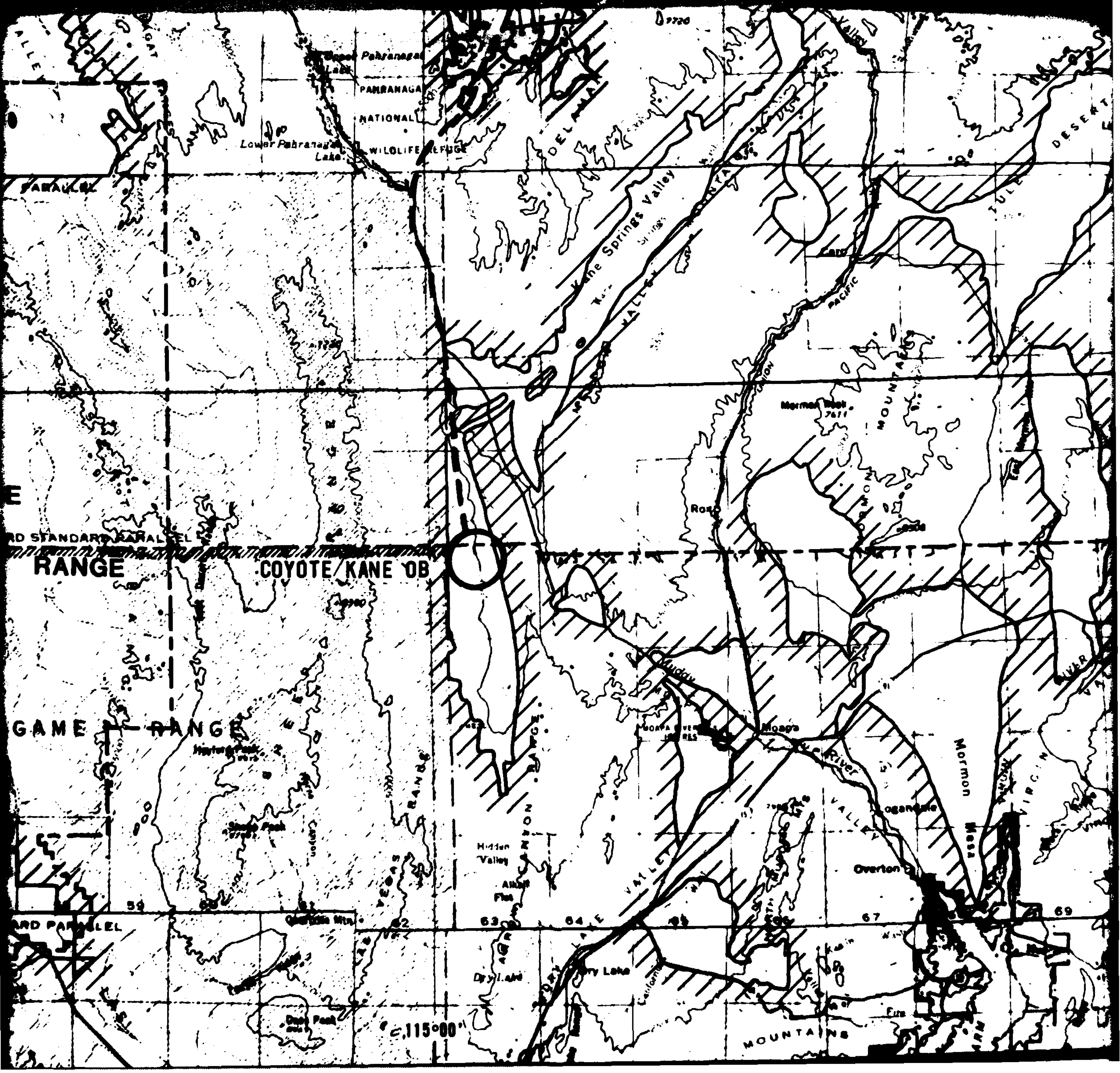
SUITABLE AREA FOR HORIZONTAL SHELTER BASED ON VERIFICATION STUDIES FY 78 AND FY 79 AND DATA GAP STUDIES FY 79 AND FY 80

POTENTIALLY SUITABLE AREA TO BE INVESTIGATED BY FY 80

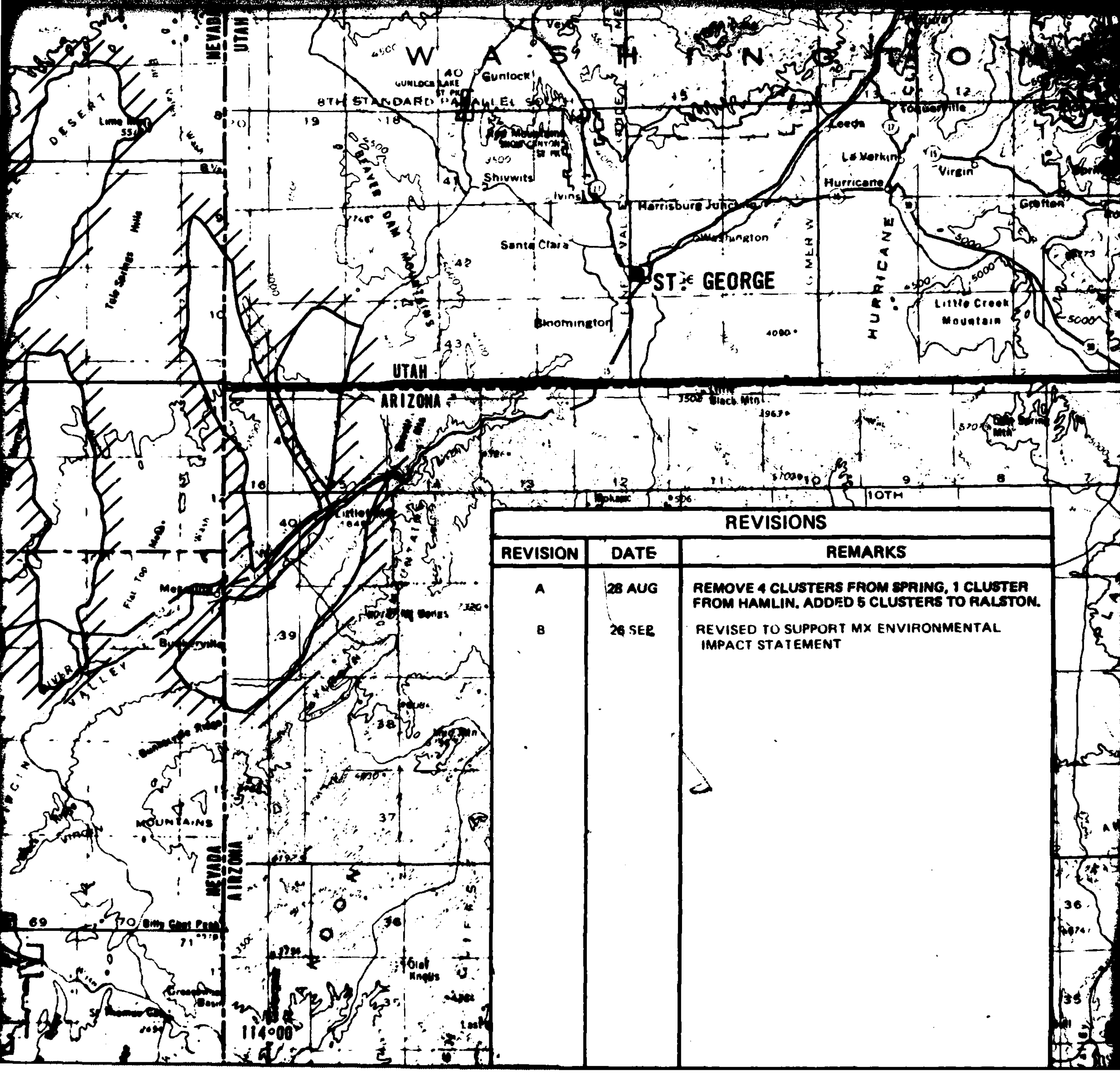

SCHMIDT LINE 1873 APPROX
37°00'
MOUNTAINS
Willow Creek Camp
Midway Well
Mesquite
Flat
DEATH
SCALE 1:500,000
0 10 20
STATUTE MILES
0 10 20
KILOMETERS
Bartlett
Keeler
Darwin
Plateau
Panamint Springs
Panamint Butte
Towne Pass
Cerro Gordo Peak
New York Butte
Dry Mtn
Stovepipe Wells



FORCE
RANGE
PAHUTE
MESA
NEVADA
TEST
SITE
(DOE)
NELLIS
AIR
Black Mtn
Pinyon Butte
Banded Mtn
Shoshone Peak
The Bench
Mercury
Lathrop Wells
AMARGOSA
Amargosa River
DESERT
NEVADA
CALIFORNIA
FLATS
Frenchman
CRATER
49
116°00

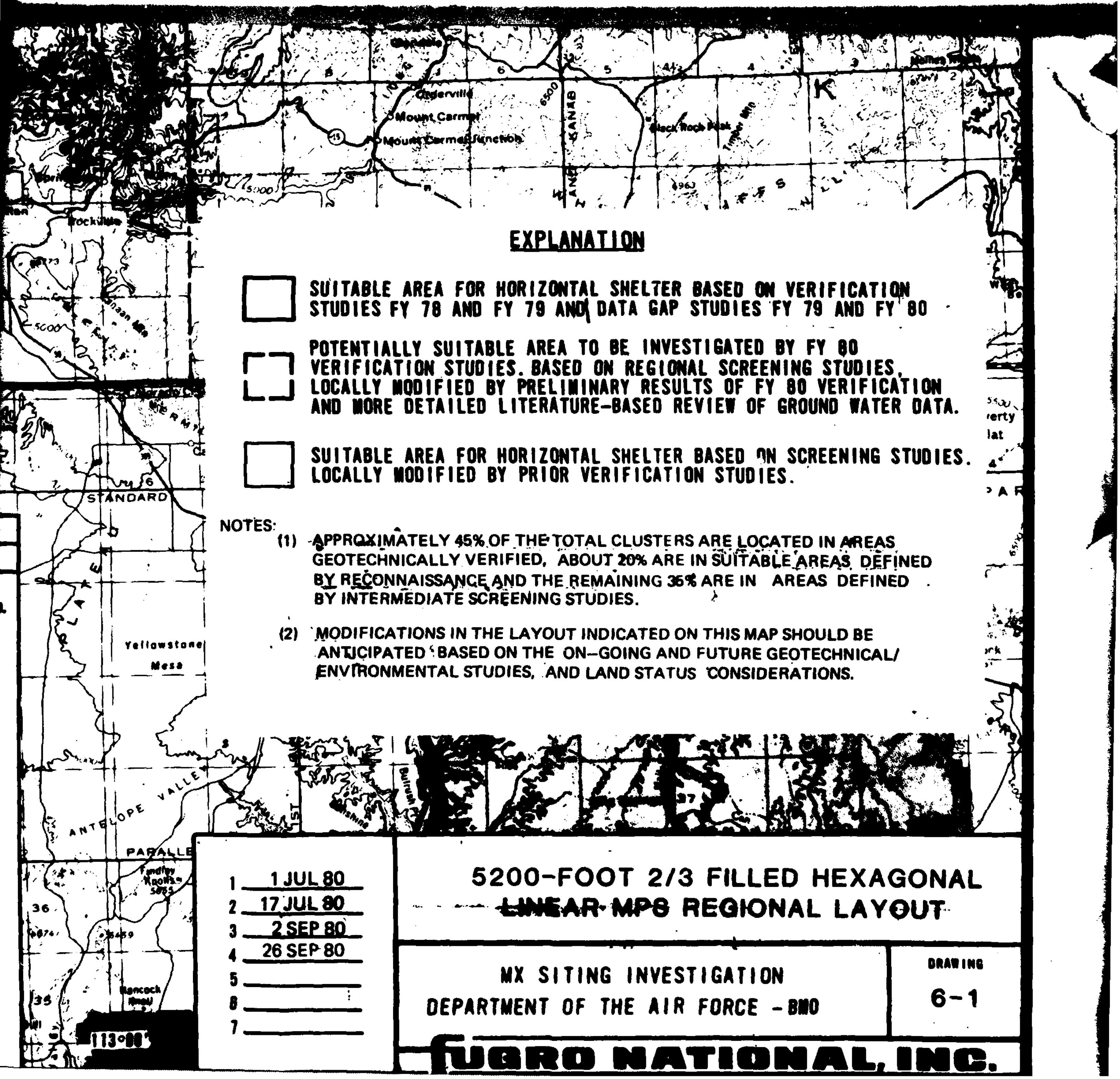


Upper Pahranagat Lake
PAHRANAGAT
NATIONAL
WILDLIFE REFUGE
Lower Pahranagat Lake
DELAMAR
Kane Springs Valley
VALLEY
PARALLEL
STANDARD PARALLEL
RANGE
COYOTE/KANE OB
GAME RANGE
Hayford Peak
Sheep Peak
Quartzite Mtn
Hidden Valley
Dry Lake
Mormon Peak
MOUNTAINS
Muddy River
Moapa
Logandale
Overton
Mormon Mesa
PACIFIC
DESERT
RIVER
59
62
63
64
67
69
115°00'
MOUNTAINS



REVISIONS

REVISION	DATE	REMARKS
A	28 AUG	REMOVE 4 CLUSTERS FROM SPRING, 1 CLUSTER FROM HAMLIN. ADDED 5 CLUSTERS TO RALSTON.
B	26 SEP	REVISED TO SUPPORT MX ENVIRONMENTAL IMPACT STATEMENT



EXPLANATION

SUITABLE AREA FOR HORIZONTAL SHELTER BASED ON VERIFICATION STUDIES FY 78 AND FY 79 AND DATA GAP STUDIES FY 79 AND FY 80

POTENTIALLY SUITABLE AREA TO BE INVESTIGATED BY FY 80 VERIFICATION STUDIES. BASED ON REGIONAL SCREENING STUDIES, LOCALLY MODIFIED BY PRELIMINARY RESULTS OF FY 80 VERIFICATION AND MORE DETAILED LITERATURE-BASED REVIEW OF GROUND WATER DATA.

SUITABLE AREA FOR HORIZONTAL SHELTER BASED ON SCREENING STUDIES. LOCALLY MODIFIED BY PRIOR VERIFICATION STUDIES.

NOTES:

(1) APPROXIMATELY 45% OF THE TOTAL CLUSTERS ARE LOCATED IN AREAS GEOTECHNICALLY VERIFIED, ABOUT 20% ARE IN SUITABLE AREAS DEFINED BY RECONNAISSANCE AND THE REMAINING 35% ARE IN AREAS DEFINED BY INTERMEDIATE SCREENING STUDIES.

(2) MODIFICATIONS IN THE LAYOUT INDICATED ON THIS MAP SHOULD BE ANTICIPATED BASED ON THE ON-GOING AND FUTURE GEOTECHNICAL/ ENVIRONMENTAL STUDIES, AND LAND STATUS CONSIDERATIONS.

1	1 JUL 80
2	17 JUL 80
3	2 SEP 80
4	26 SEP 80
5	
6	
7	

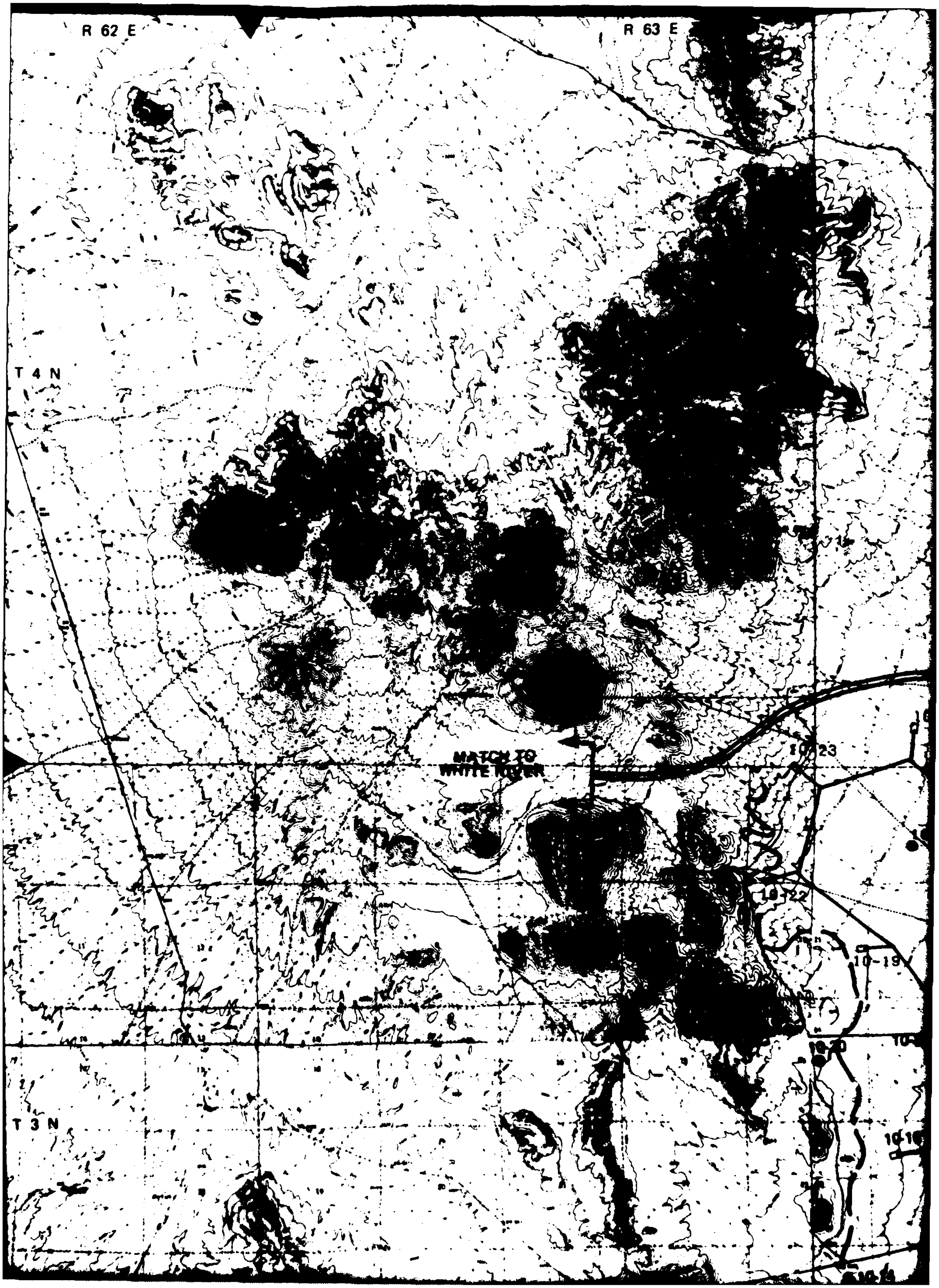
5200-FOOT 2/3 FILLED HEXAGONAL ~~LINEAR MPS~~ REGIONAL LAYOUT

MX SITING INVESTIGATION

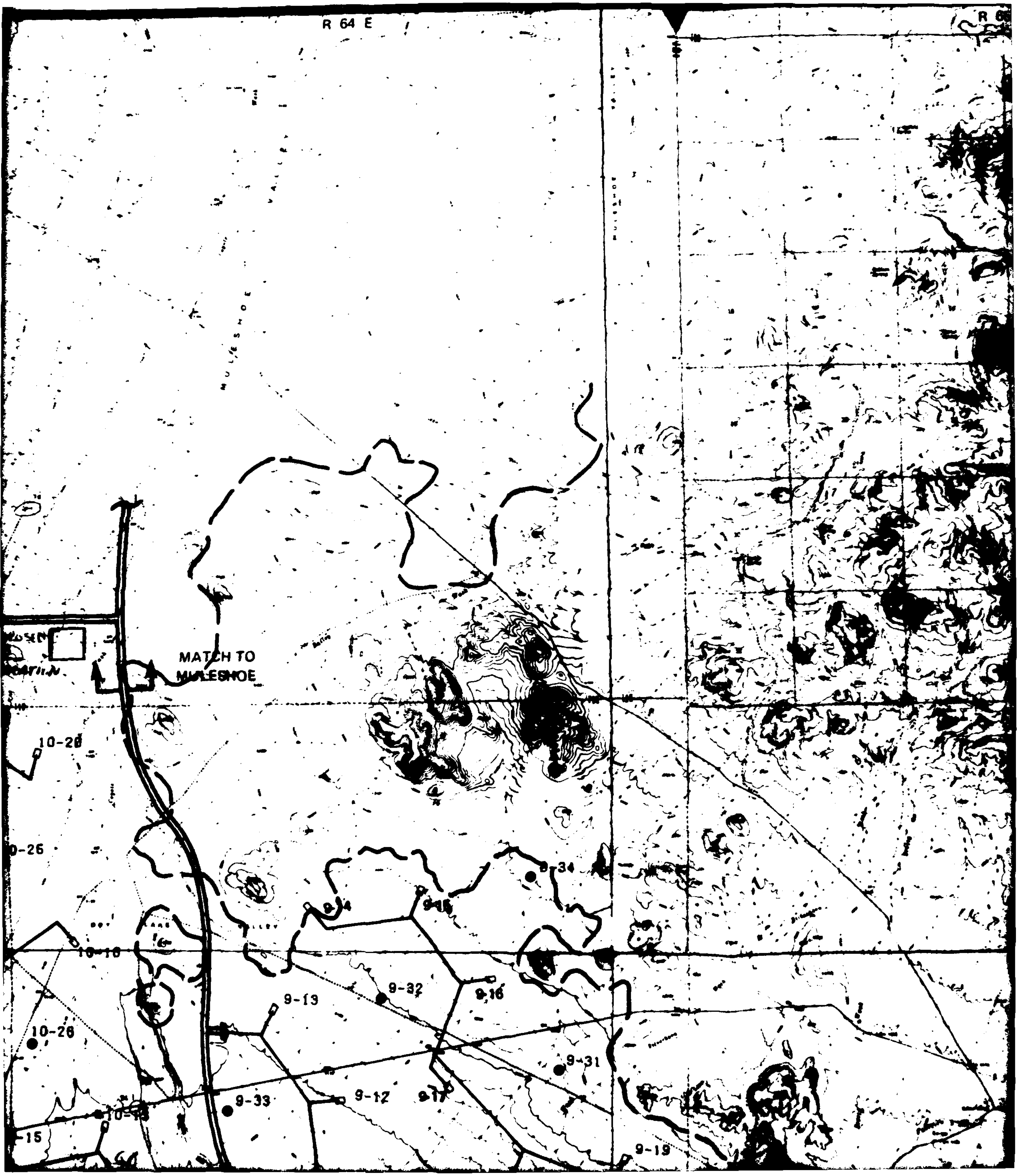
DEPARTMENT OF THE AIR FORCE - BMO

DRAWING 6-1

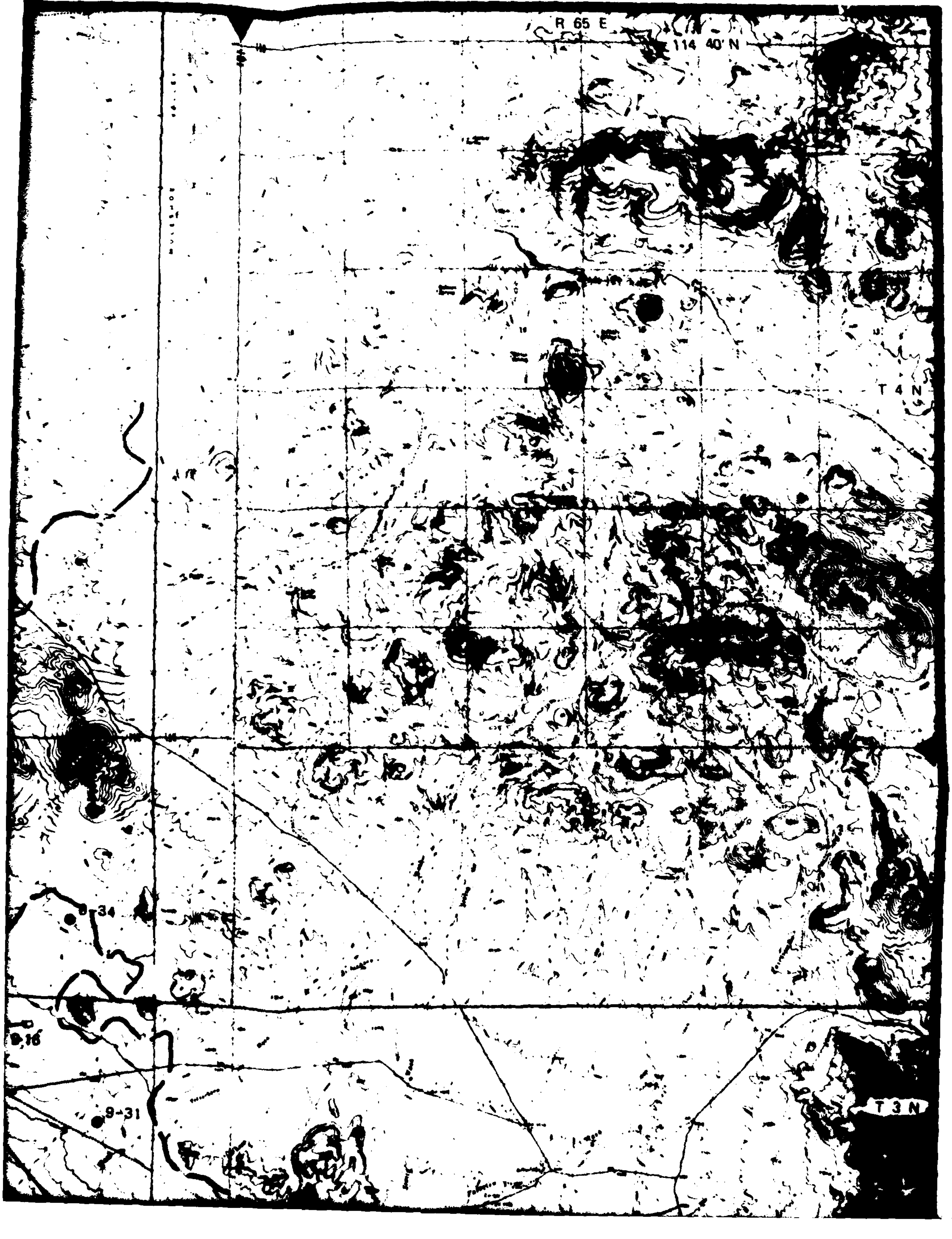
FUGRO NATIONAL, INC.



R 62 E
R 63 E
T 4 N
MATCH TO
WHITE RIVER
10-23
10-22
10-19
10-20
T 3 N


R 64 E
MATCH TO
MULESHOE
MULESHOE
10-28
10-26
9-34
9-14
9-15
10-16
9-32
9-16
9-13
10-26
9-31
9-33
9-12
9-17
9-19
-15

3



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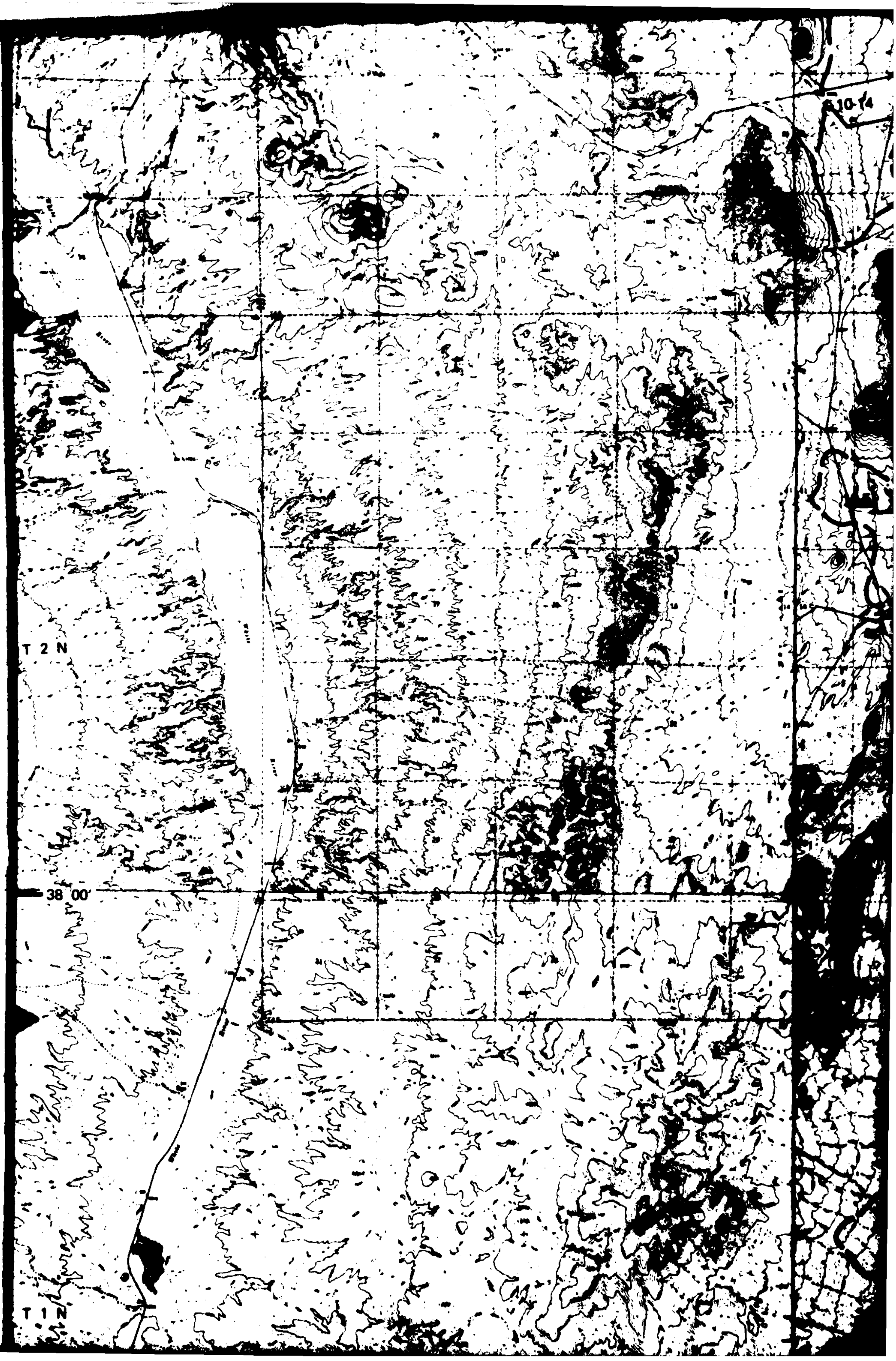

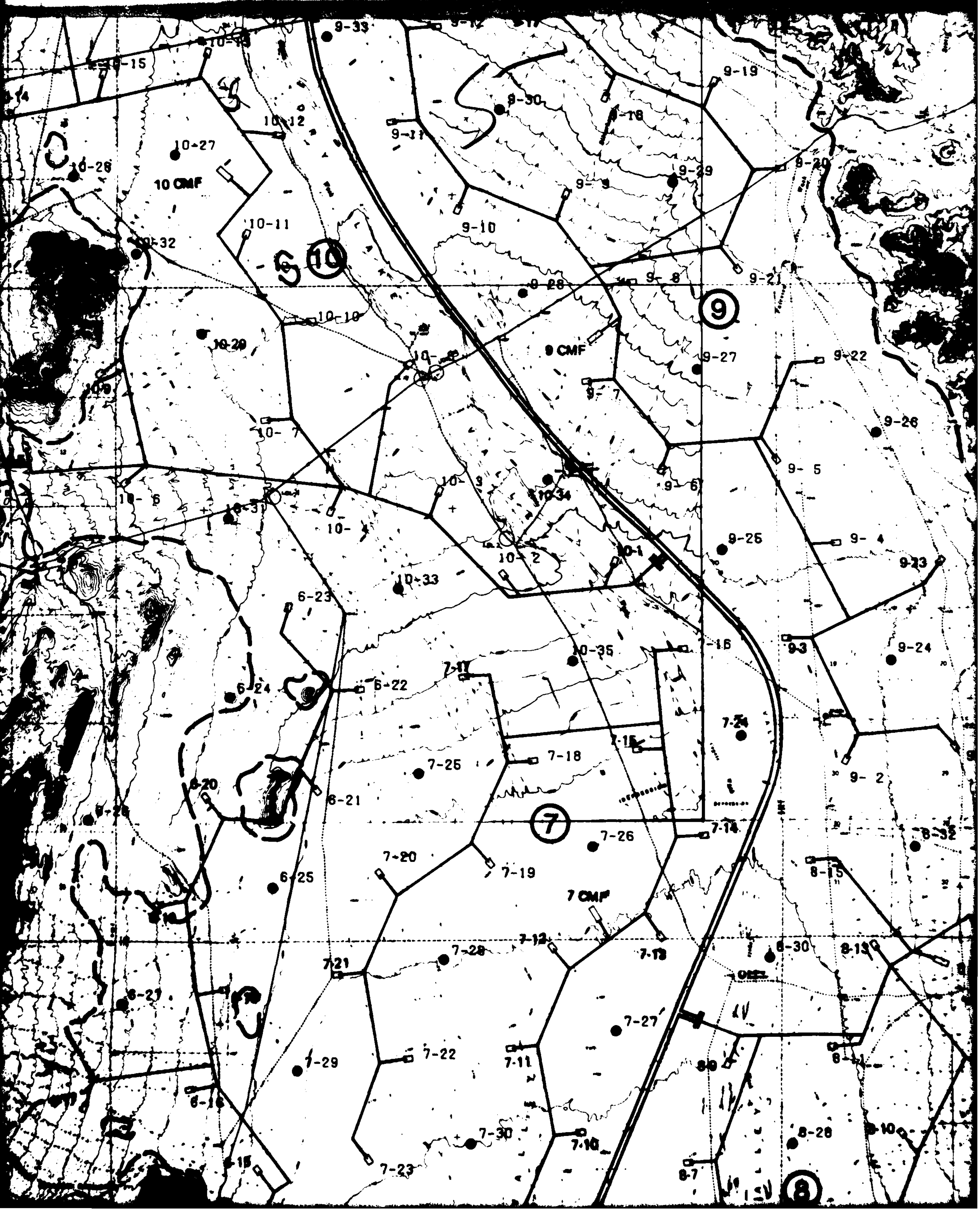
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7 CMF
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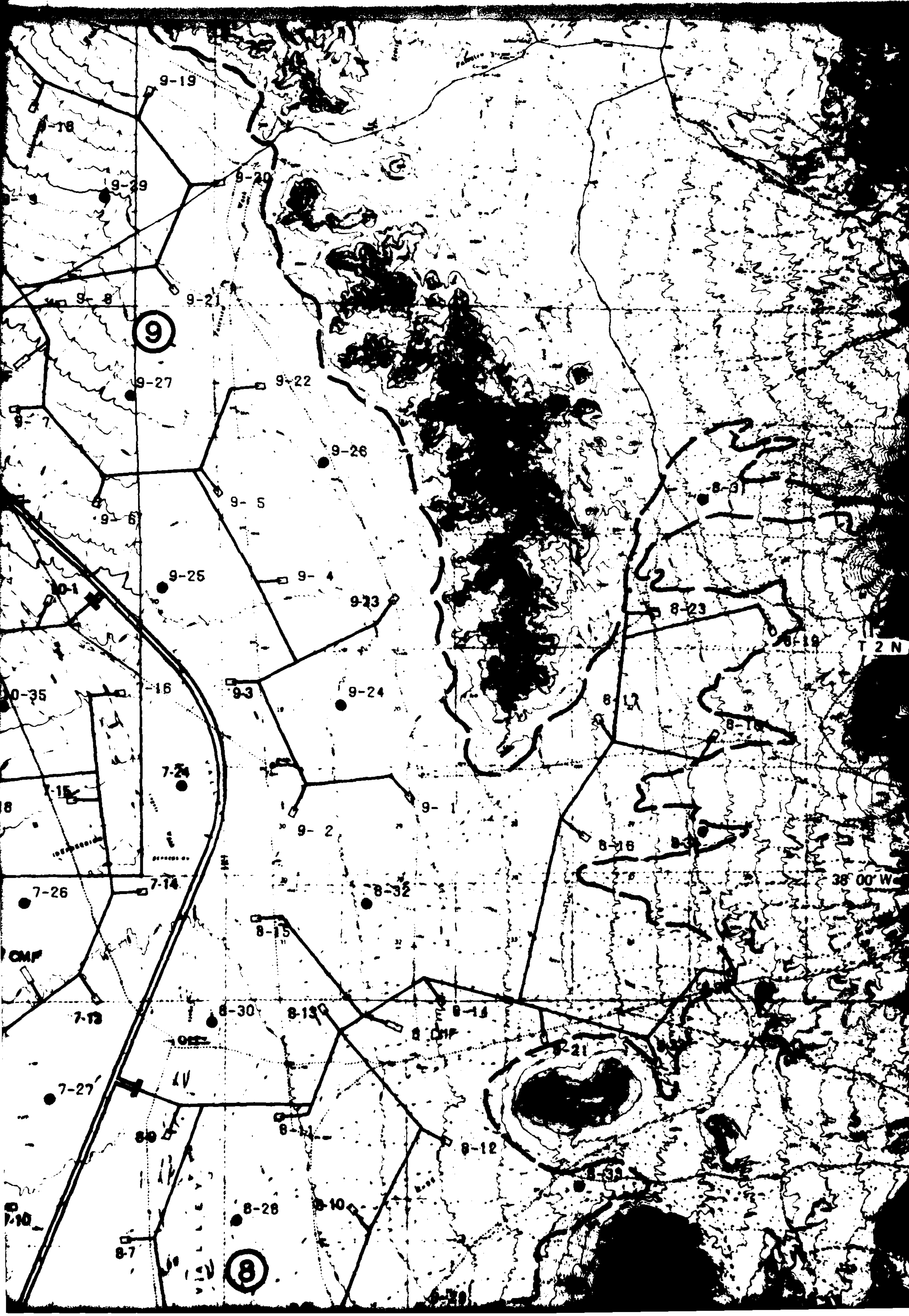

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8-16
8-33
38' 00" W
7-26
7-14
8-32
8-15
CMF
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8 CMF
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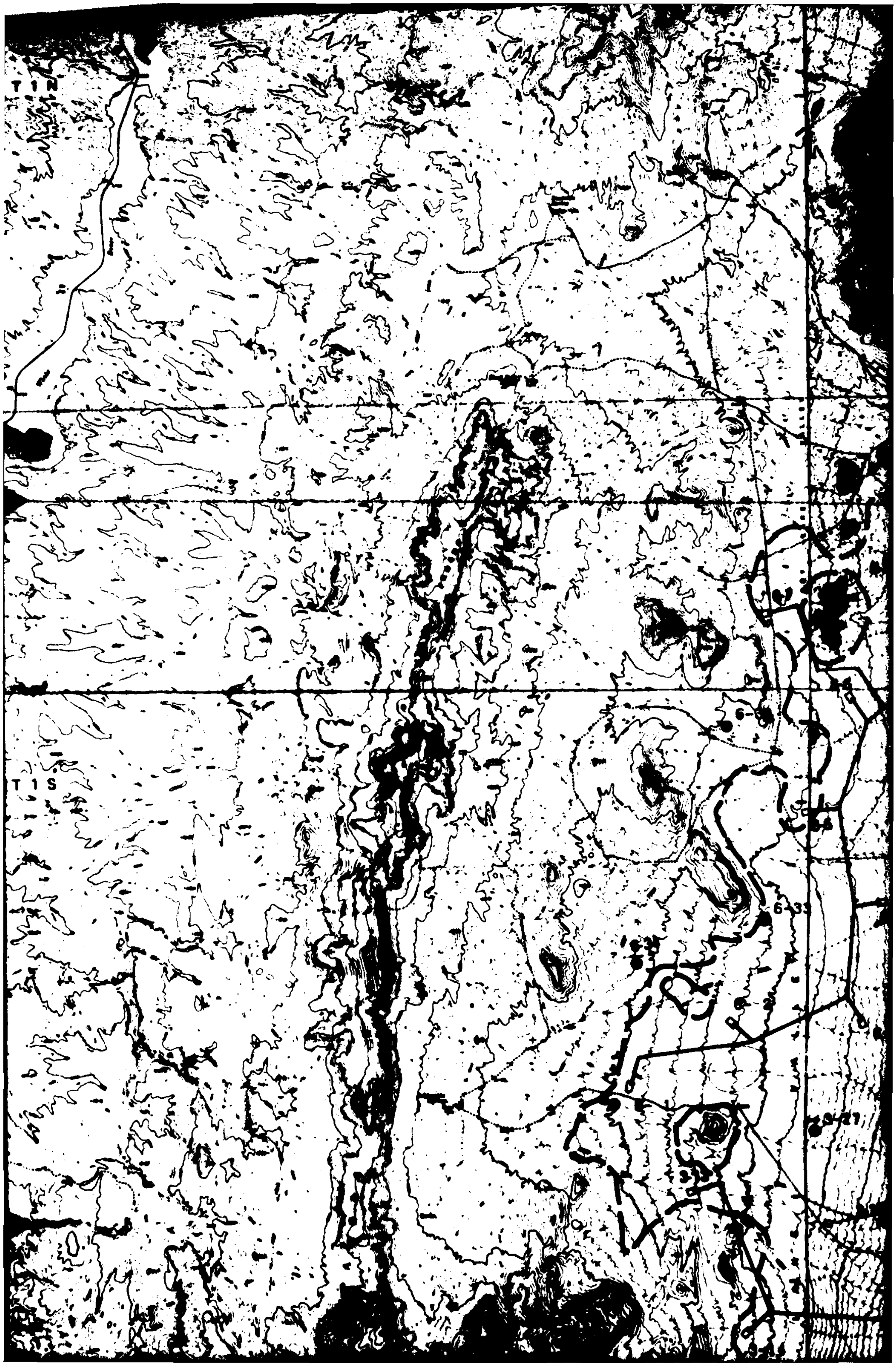
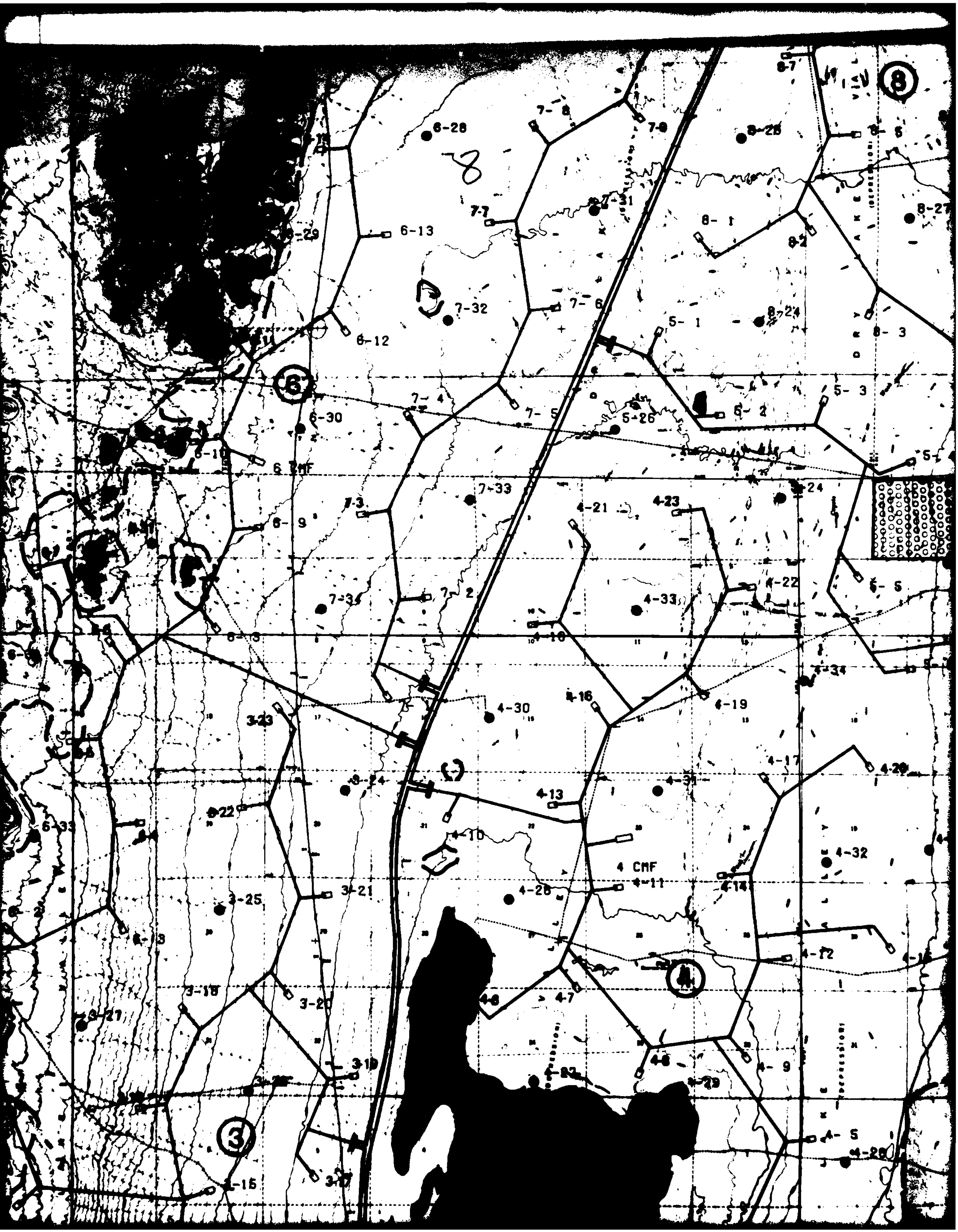

T1N
T1S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6 CMF
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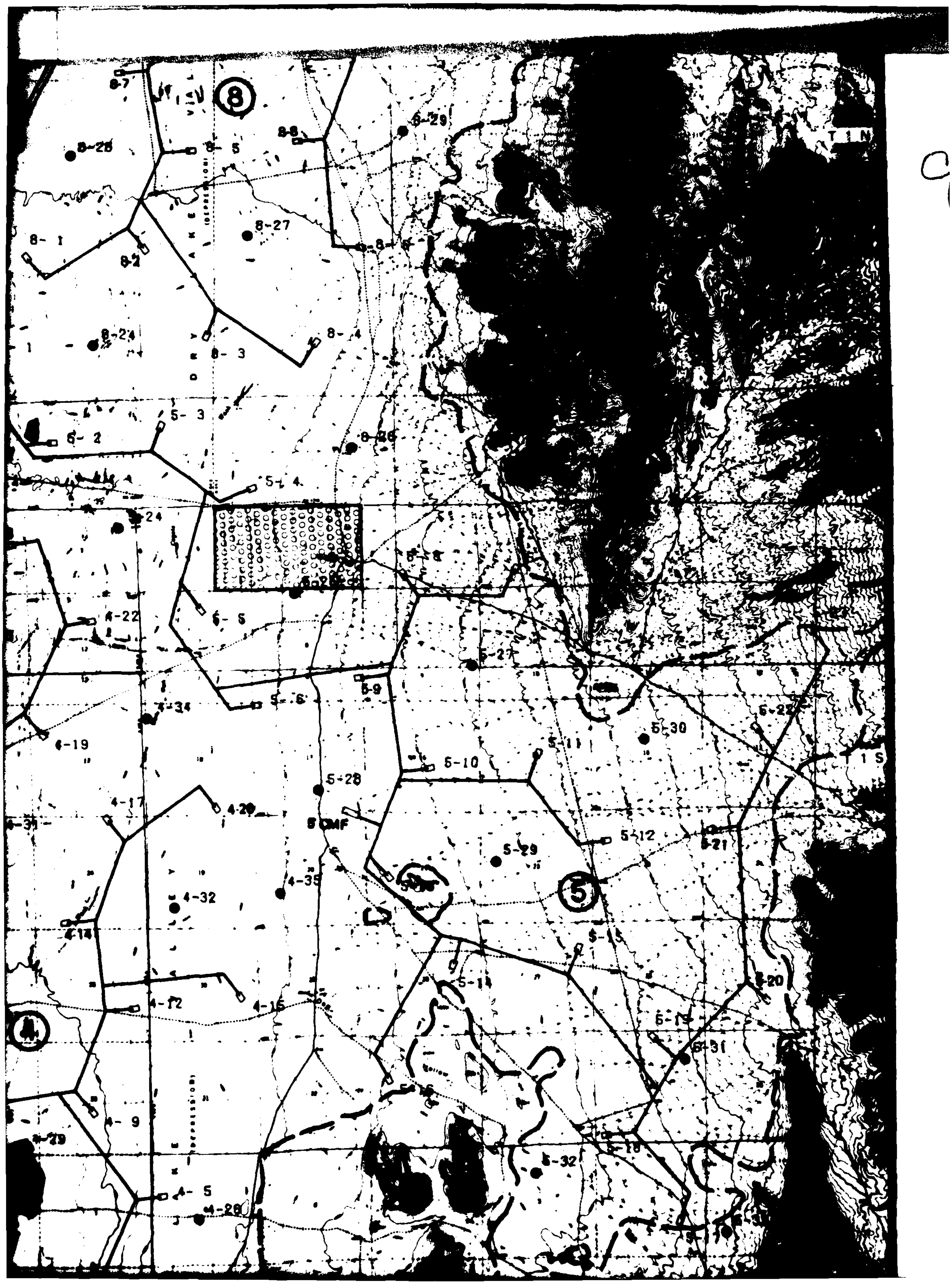

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5 CMF
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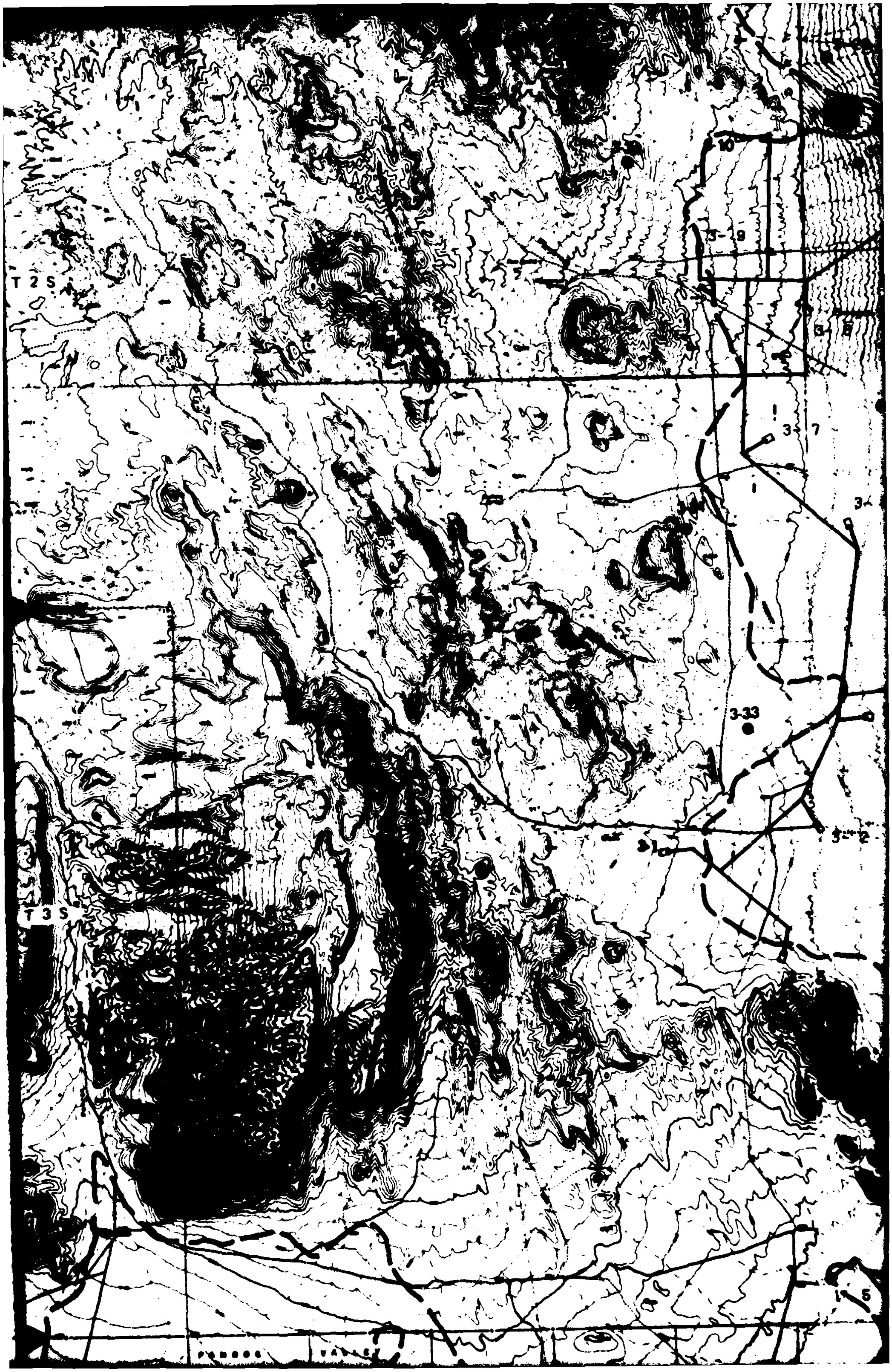
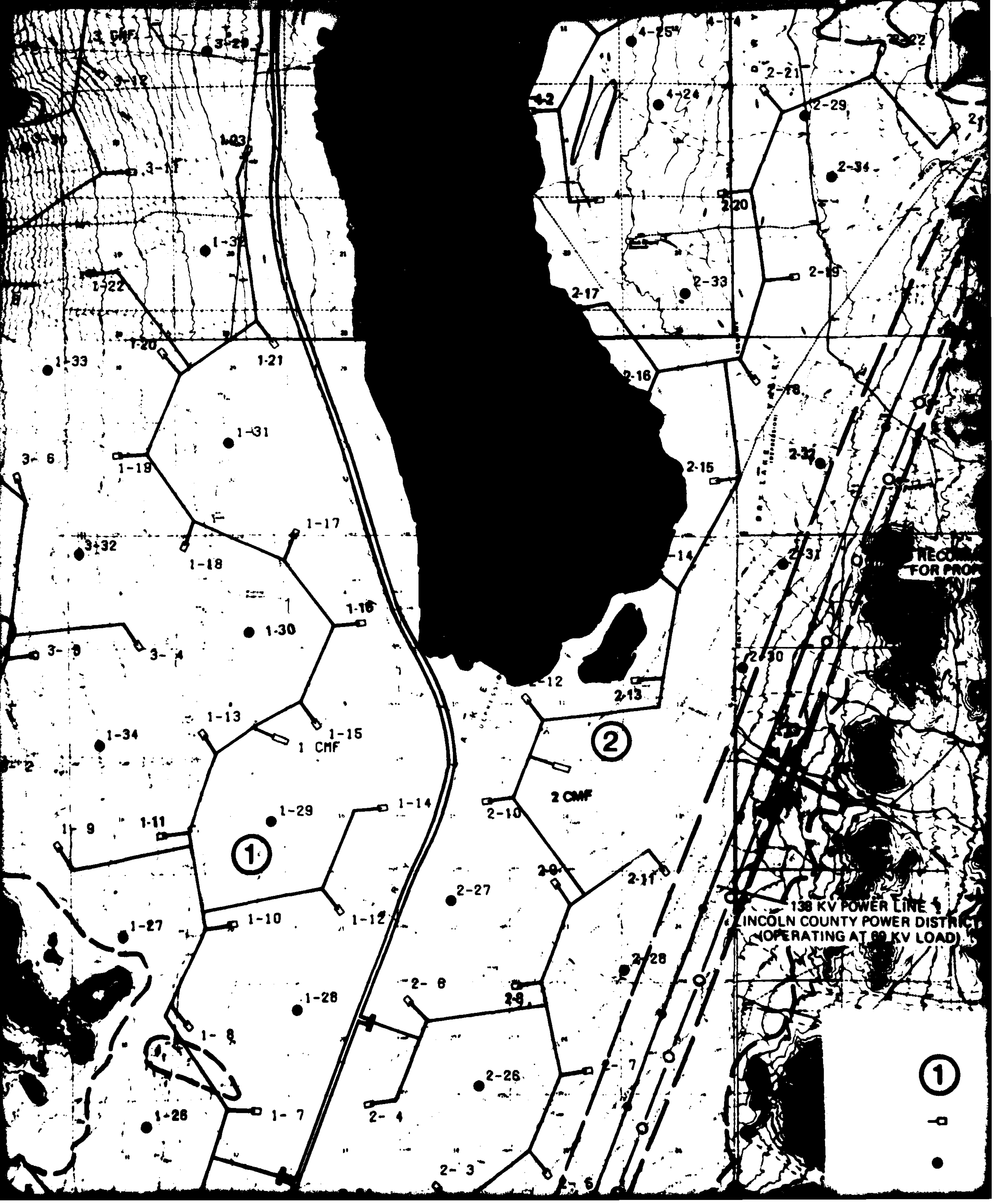

T 2 S
T 3 S
10
3-33


3 CMF
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RECOMM
FOR PROP
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1-15
1 CMF
1-34
2
2 CMF
1-14
1-29
2-10
1-11
1-9
1
2-9
2-11
2-27
1-10
1-12
138 KV POWER LINE
LINCOLN COUNTY POWER DISTRICT
(OPERATING AT 69 KV LOAD)
1-27
2-28
2-6
1-28
2-8
1-8
2-7
2-26
1-26
1-7
2-4
2-3

12
2-25
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2-23
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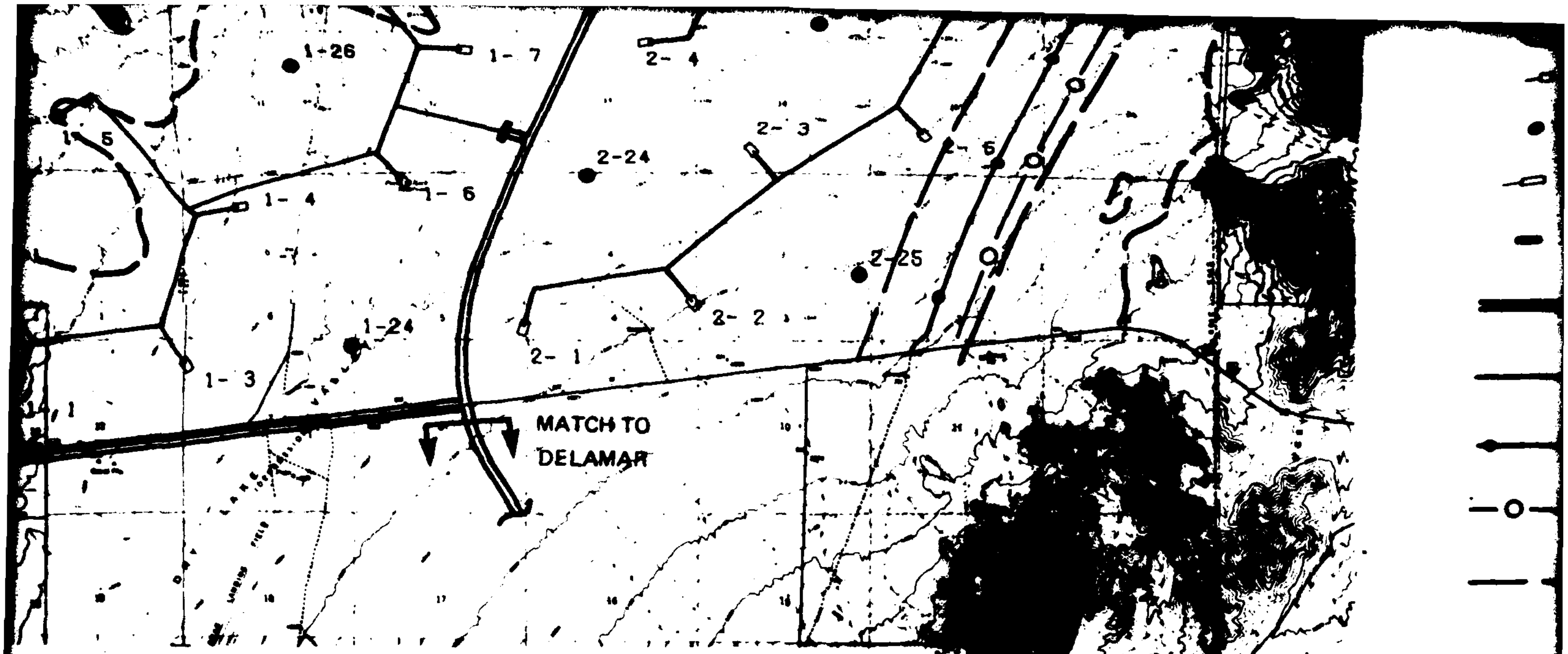
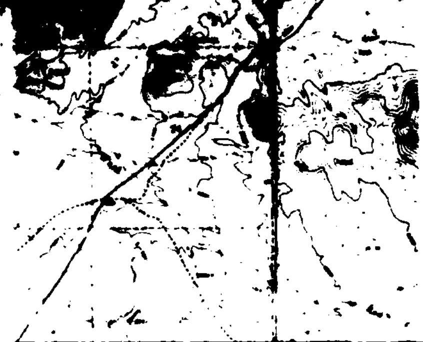
T 2 S
2-16
2-18
2-32
2-15
2-14
2-31
RECOMMENDED ALIGNMENT
FOR PROPOSED IPP KV DC LINE
2-30
2-13
NORTH
SCALE 1:62,500
0 1 2
STATUTE MILES
0 1 2
KILOMETERS
2-11
138 KV POWER LINE
LINCOLN COUNTY POWER DISTRICT
(OPERATING AT 69 KV LOAD)
2-28
EXPLANATION
1
CLUSTERS
SHELTER SITE
SHELTER BACKFILL SITE


MATCH TO
PAHROC
T 4 S
T 5 S
R 62 E
R 63 E
CODE
1
2
3
4
5





NOTES 1
2

LAND STATUS EXPLANATION

CORPS OF ENGINEERS RECOMMENDED EXCLUSIONS (CODE 1)	NONE
FEE LAND (CODES 1, 2, 3 & 4)	
PATENTED MINING CLAIMS (CODES 1, 2 & 3)	NONE
HIGHWAY MATERIAL SITES (CODES 1 & 2)	NONE
LEASED STATE LAND (CODES 1, 2, 3 & 4)	NONE
UNLEASED STATE LAND (CODES 1, 2, 3 & 4)	NONE
WILDERNESS STUDY AREAS (CODE 5)	NONE

CODE	SOURCE
1	A.I.M. LAND STATUS SHEET COE 1976
2	B.L.M. MASTER TITLE PLATS 1978-80
3	UTAH LAND OWNERSHIP AND PUBLIC MANAGEMENT MAPS B.L.M. 1976-1979
4	UTAH STATE LANDS OFFICE 1980
5	WILDERNESS INVENTORY MAPS 1980

DEPARTME

5200-FOOT 2/3

DRY LAK

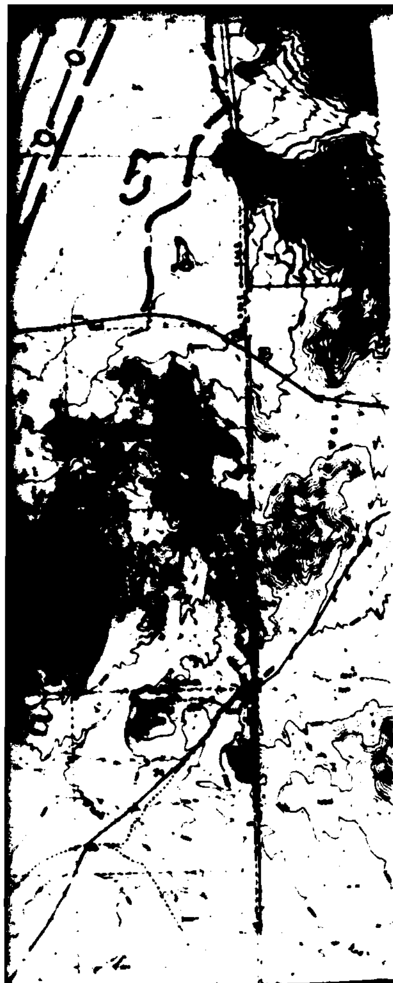
(1

REVISIONS	DATE	REMARKS
		SHELTERS, BACKFILLS, CMF'S, R ARE AS SURVEYED IN THE FIEL ROAD PATTERN DEPICTED IS CO CRN.

AIR FORCE REGION

NORTON AIR FORCE

CALIFO



SHELTER SITE

SHELTER BACKFILL SITE

CLUSTER MAINTENANCE FACILITY (CMF)

BARRIER

DESIGNATED TRANSPORTATION NETWORK (DTN)

CLUSTER ROAD

OVERHEAD POWER LINE

PROPOSED OVERHEAD POWER LINE

SUITABLE AREA BOUNDARY

NOTES
1. CLUSTER FACILITIES ARE NOT TO SCALE DUE TO MAP SCALE LIMITATIONS.
2. CONTOUR BASE DERIVED FROM PHOTO COMPOSITE OF 7½ USGS QUADS. PUBLICATION DATES 1960 1972

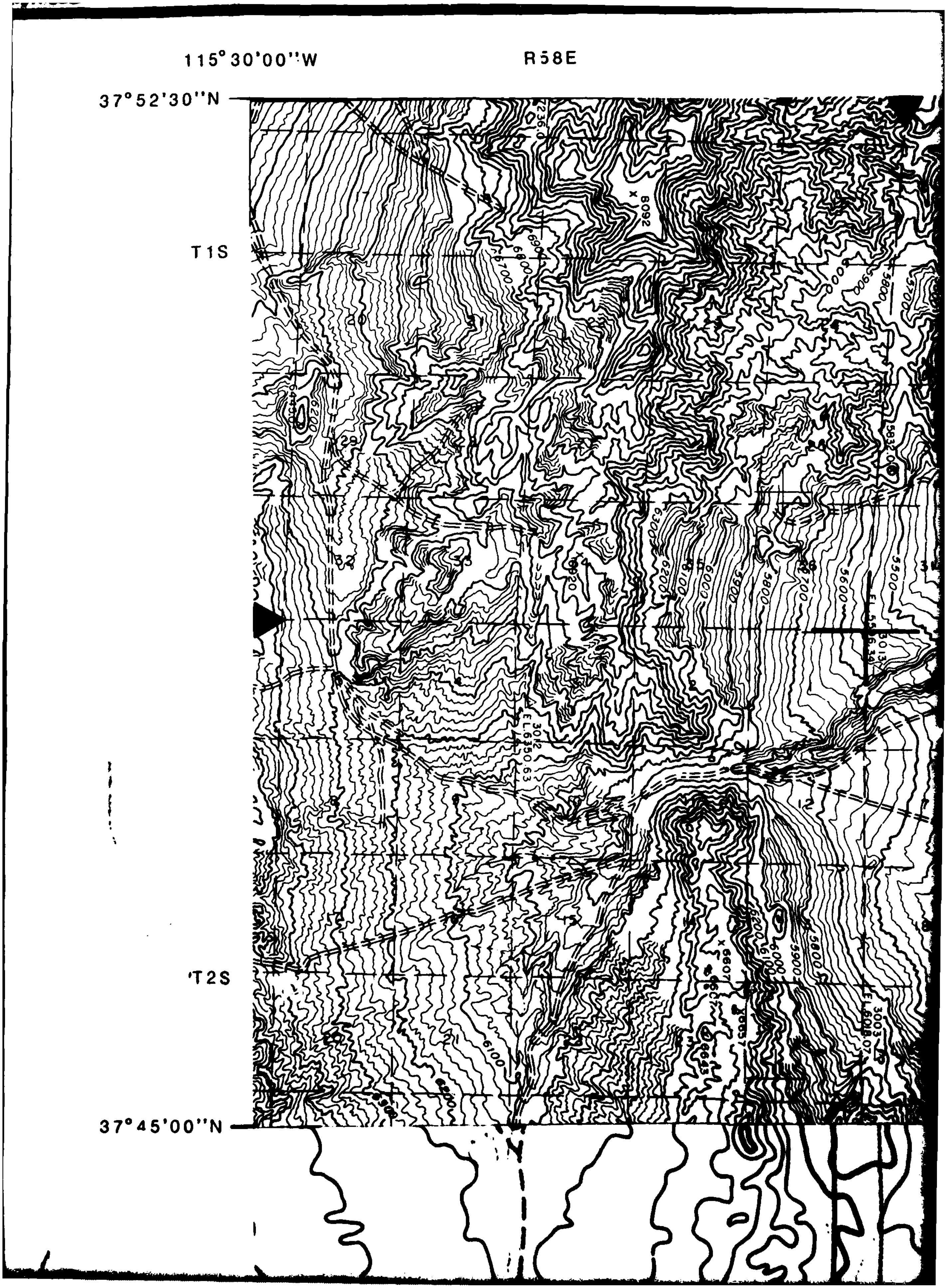
DEPARTMENT OF THE AIR FORCE

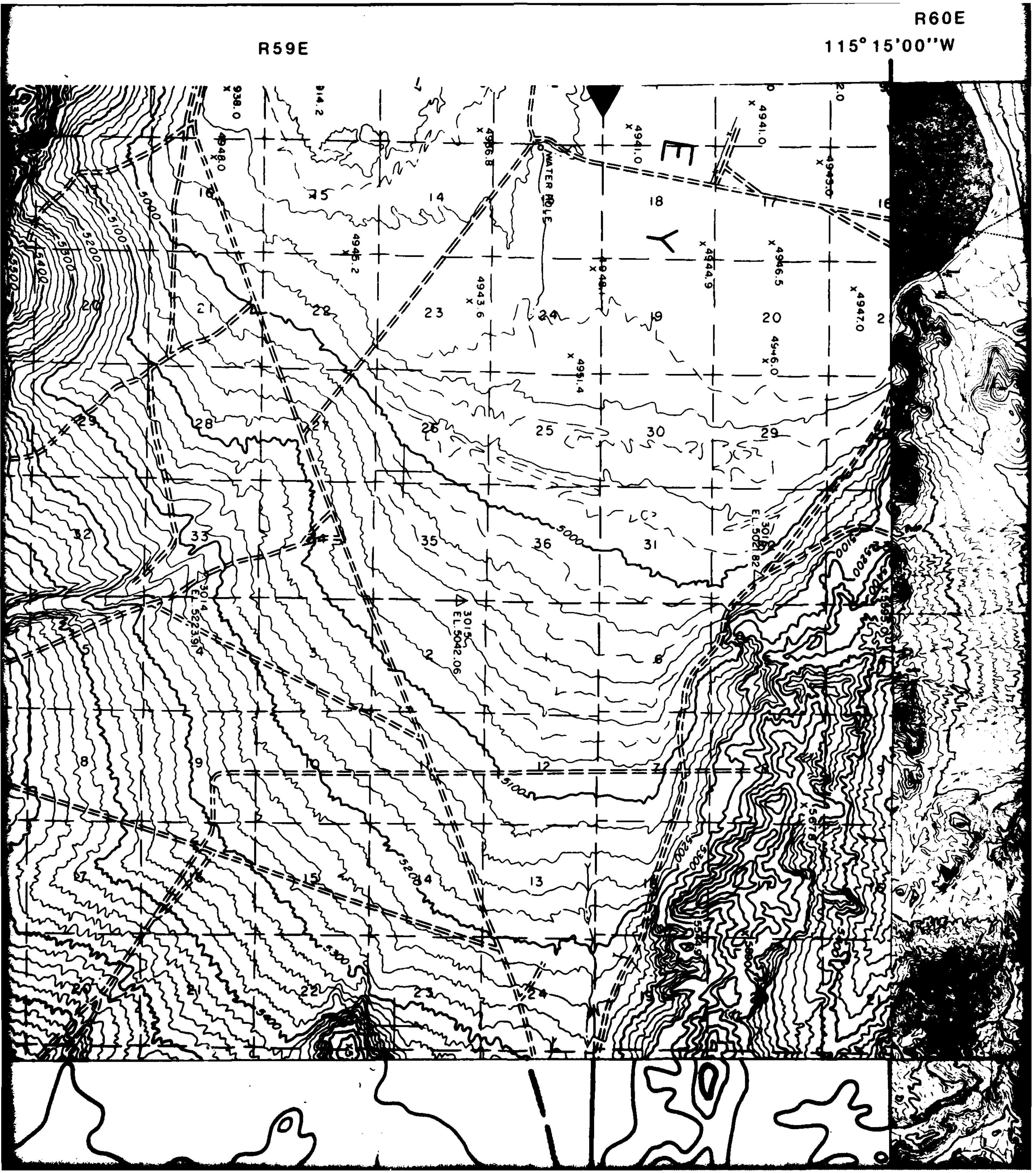
5200-FOOT 2/3 FILLED HEXAGONAL LAYOUT
DRY LAKE VALLEY, NEVADA
(1:62,500 SCALE)

REVISIONS	DATE	REMARKS	APPROVED BY	SIGNATURE	DATE	REVISIONS
		SHELTERS, BACKFILLS, CMF'S, RSS LOCATIONS ARE AS SURVEYED IN THE FIELD SCHEMATIC ROAD PATTERN DEPICTED IS CONVENTIONAL CRN.	Entec			
			HDR			
			TRW			
			AFRCE			
			BMO			

AIR FORCE REGIONAL CIVIL ENGINEER-MX
NORTON AIR FORCE BASE, SAN BERNARDINO, CALIFORNIA 92409

DRAWING 9


115°30'00"W
R58E
37°52'30"N
T1S
T2S
37°45'00"N

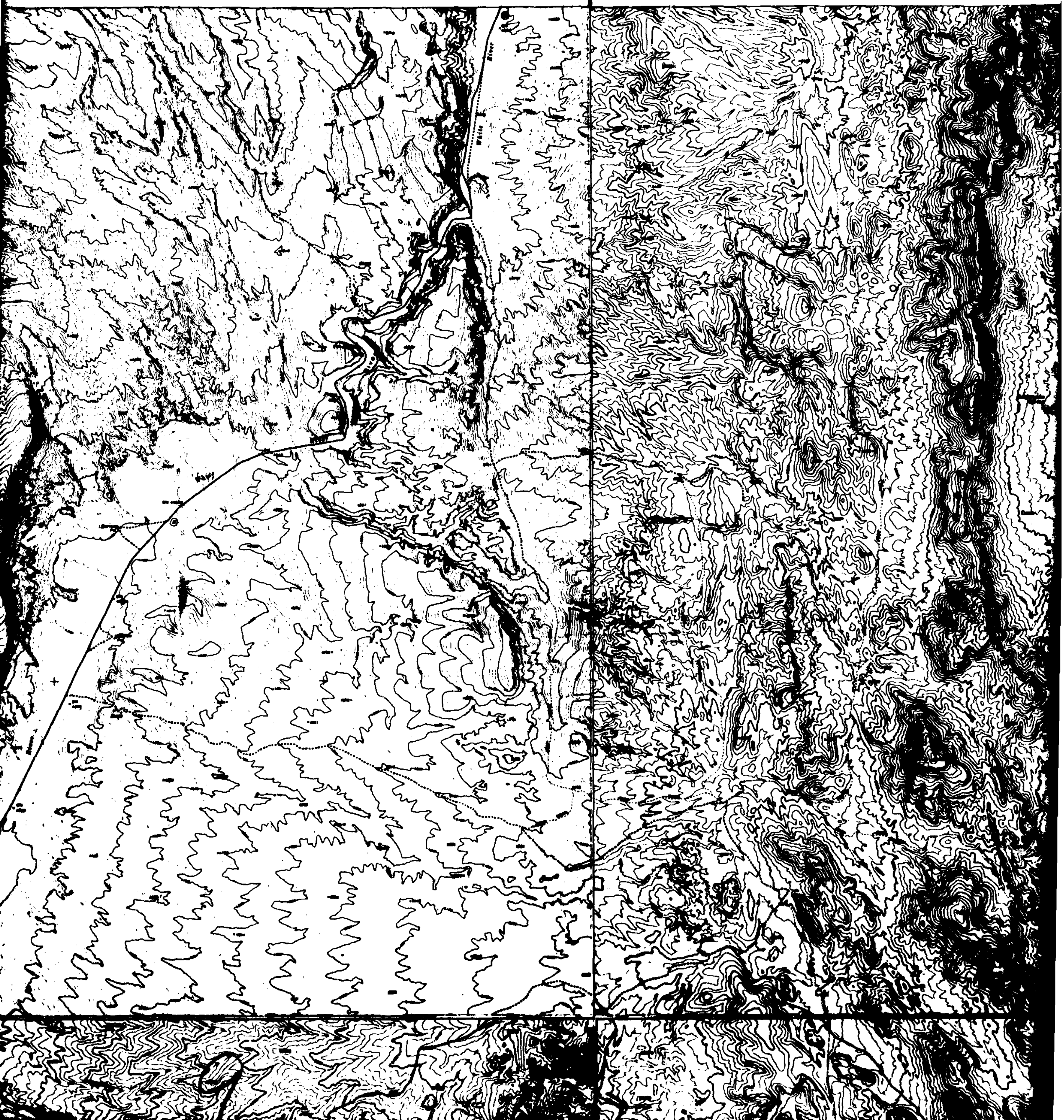

R59E
R60E
115° 15'00"W
WATER HOLE
5000
5100
5200
5300
5400
3014
EL.5223.914
3015
EL.5042.06
3016
EL.502.82

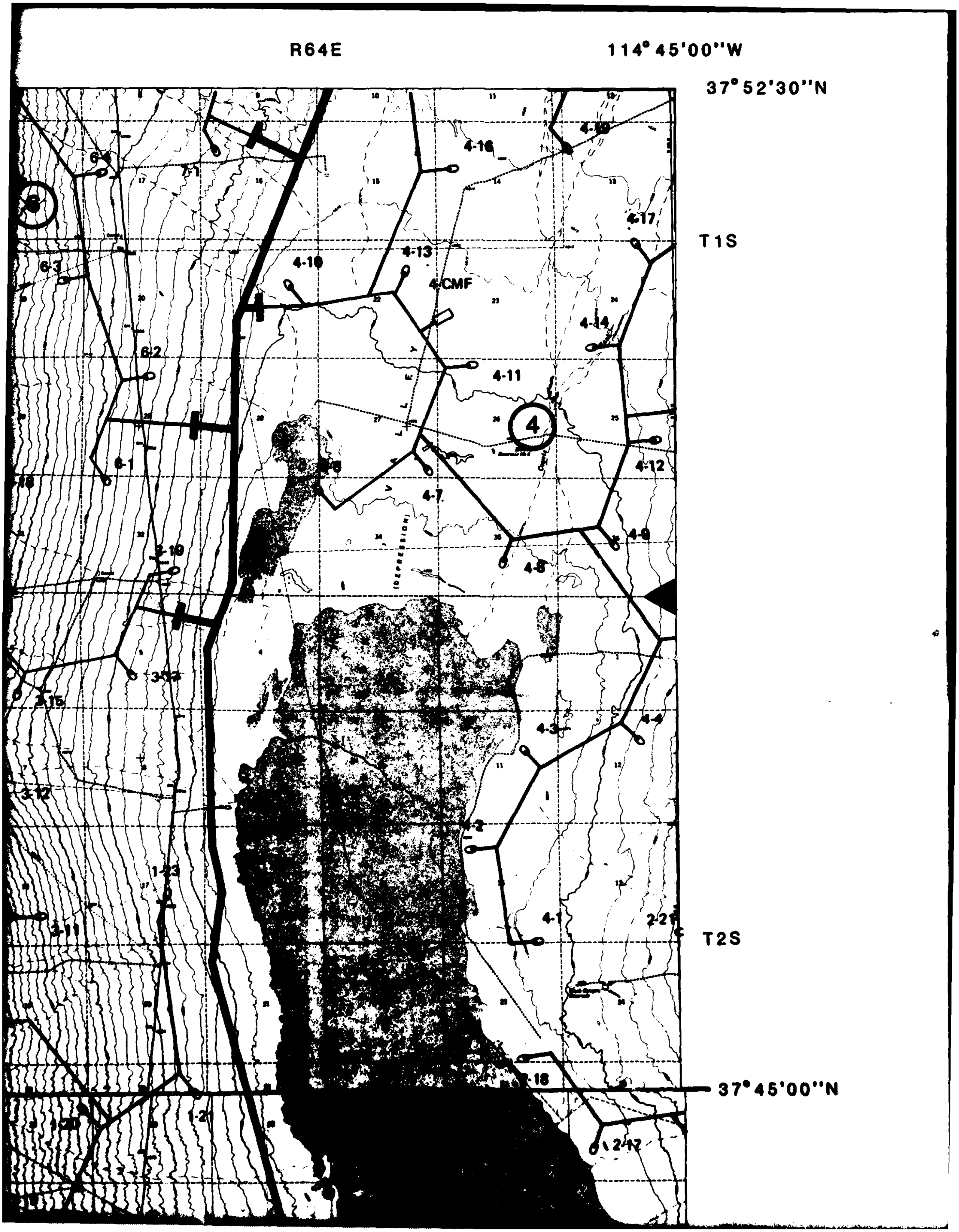
SEE DRAWING #26

R61E

WING #26

R62E 115°00'00"W



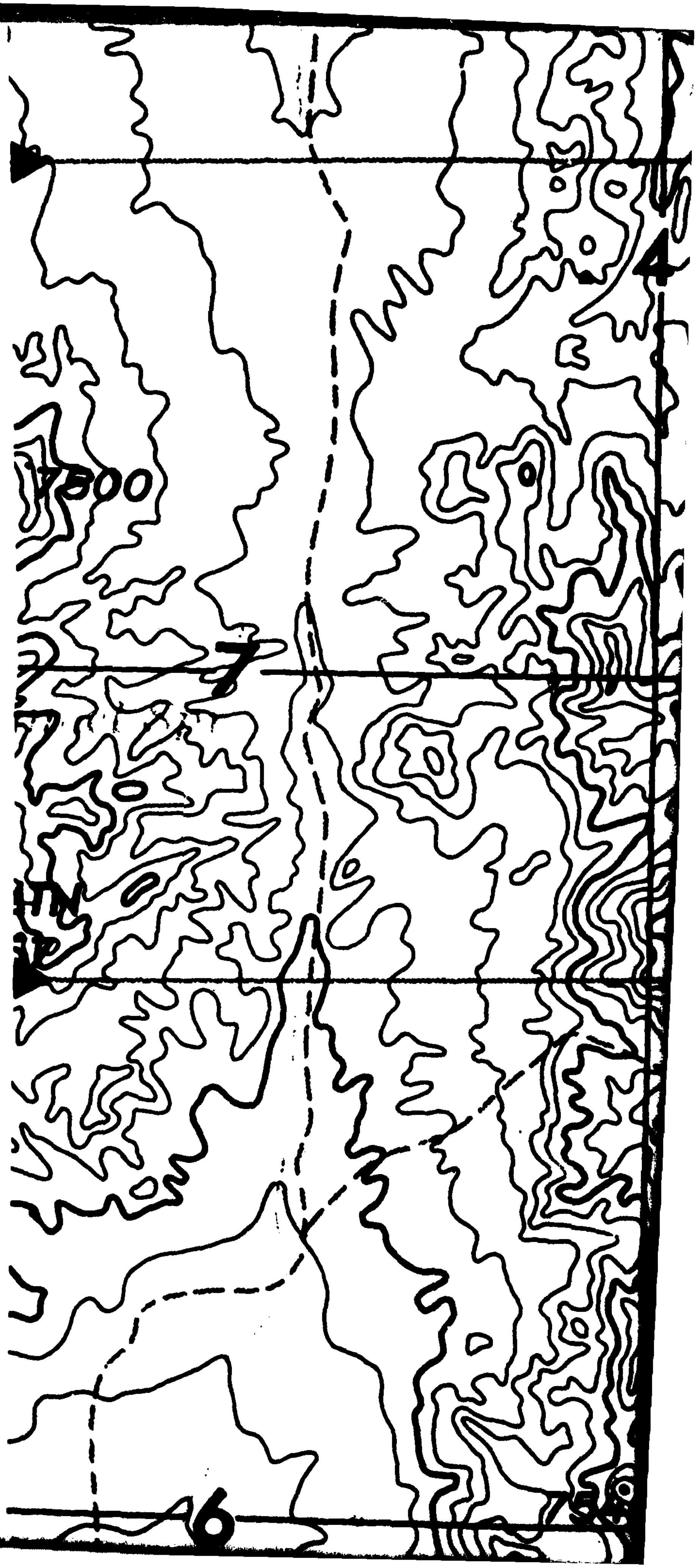


R64E
114° 45'00"W
37° 52'30"N
T1S
T2S
37° 45'00"N
4-16
4-10
4-13
4-CMF
4-17
4-14
4-11
4
4-12
4-7
4-9
4-8
4-3
4-4
4-1
4-18
2-17
2-21
6-3
6-2
6-1
7-1
2-19
3-13
3-15
3-12
3-11
1-23
1-21
(DEPRESSION)

6

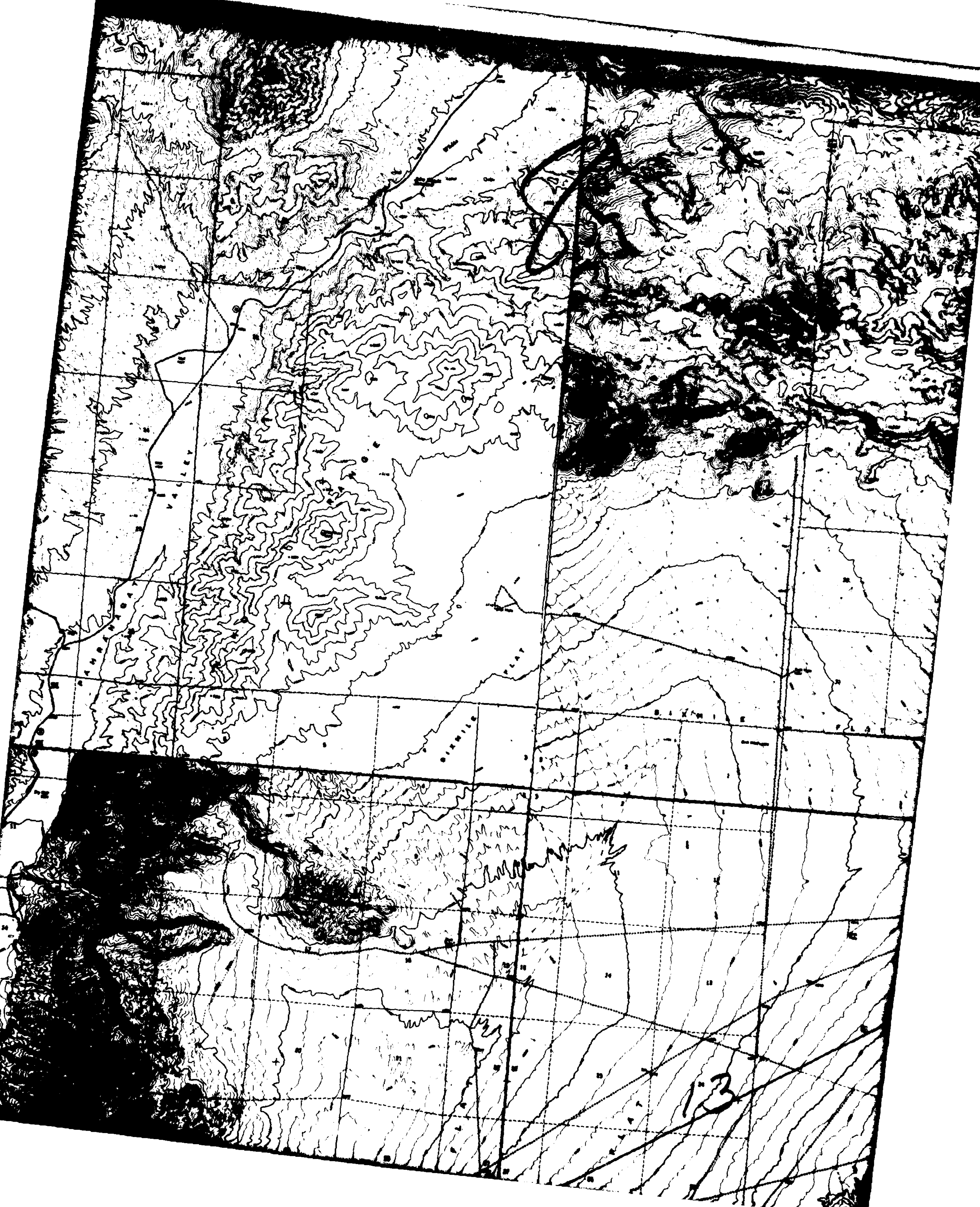
SEE DRAWING
#19

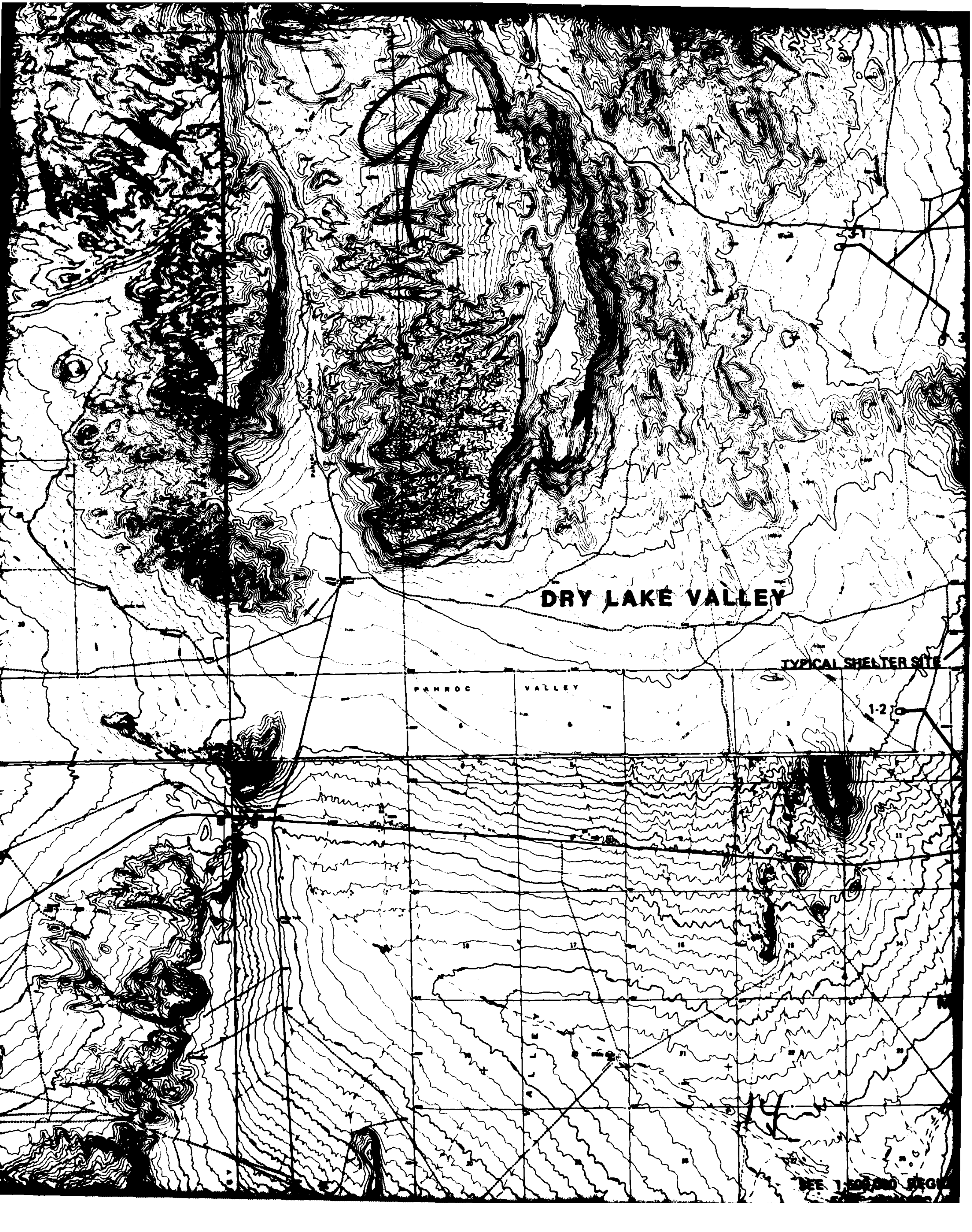
T3S



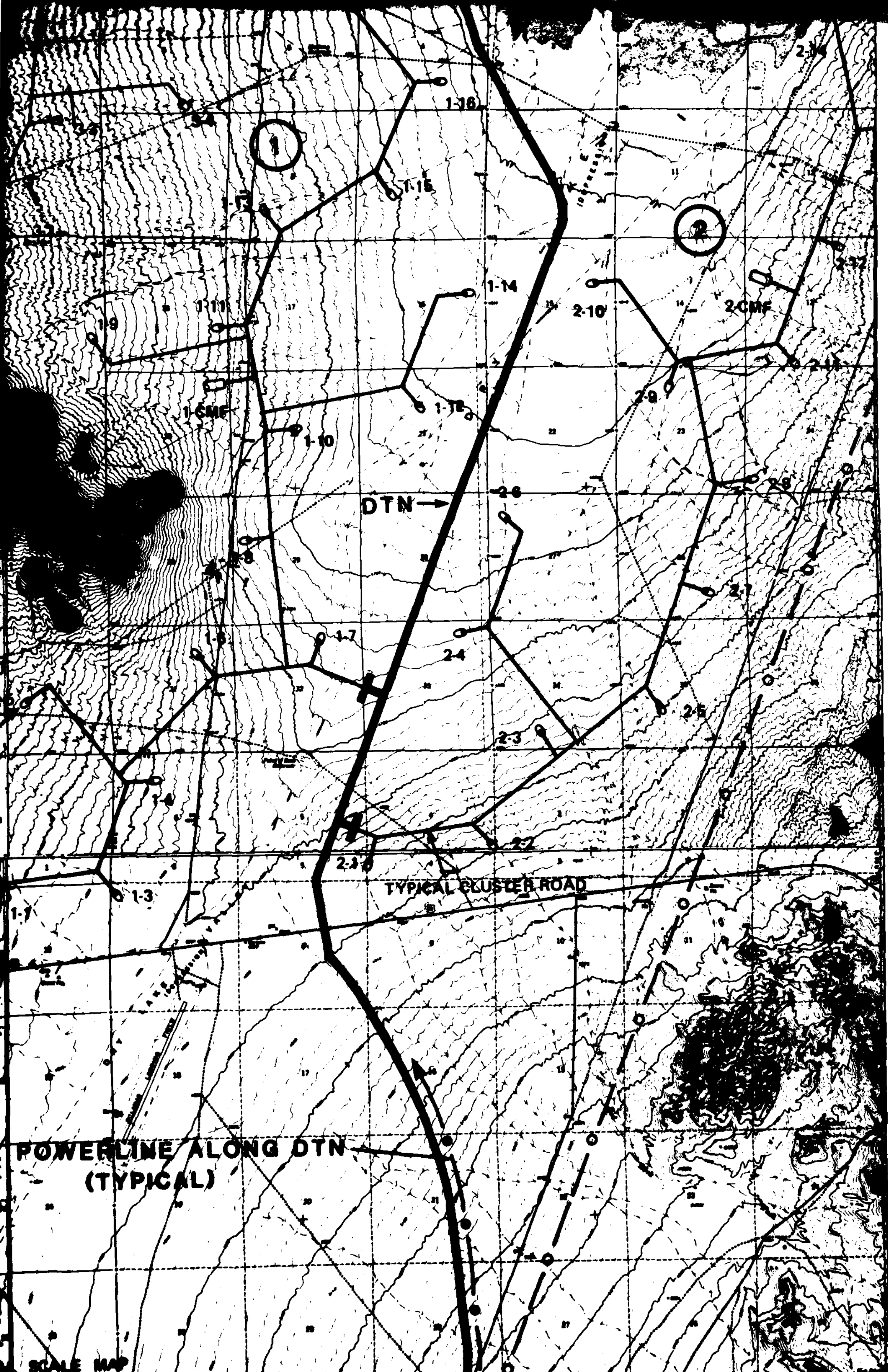
T4S

6780
5
6410
T 3 S
OUNT IRISH
7000
6000
5000
4400
12
RANGE


SIXMILE FLAT
13


DRY LAKE VALLEY
TYPICAL SHELTER SITE
PAHROC VALLEY
1-2
3-1
SEE 1:500,000 REGION

10

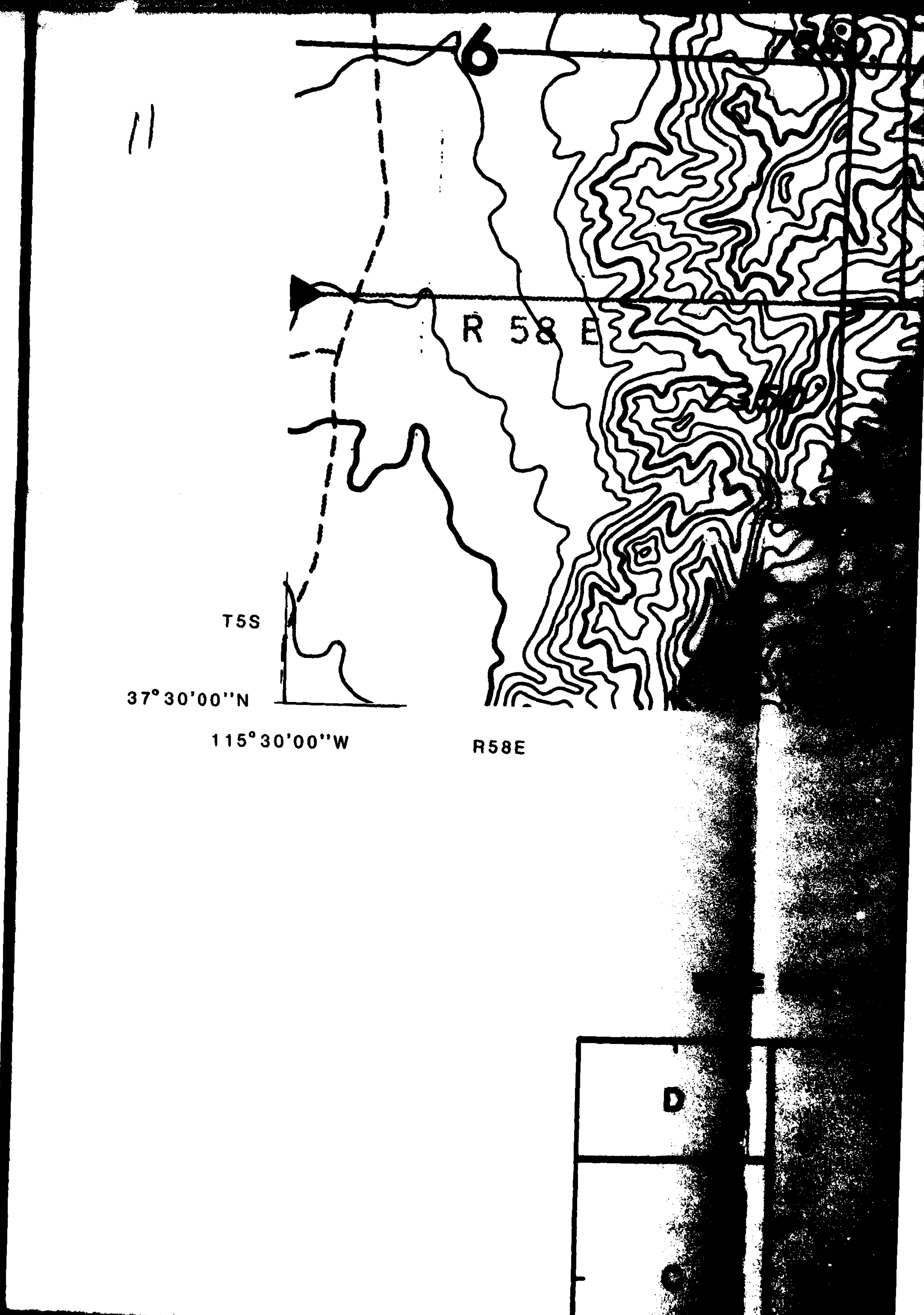


SEE DRAWING
#38

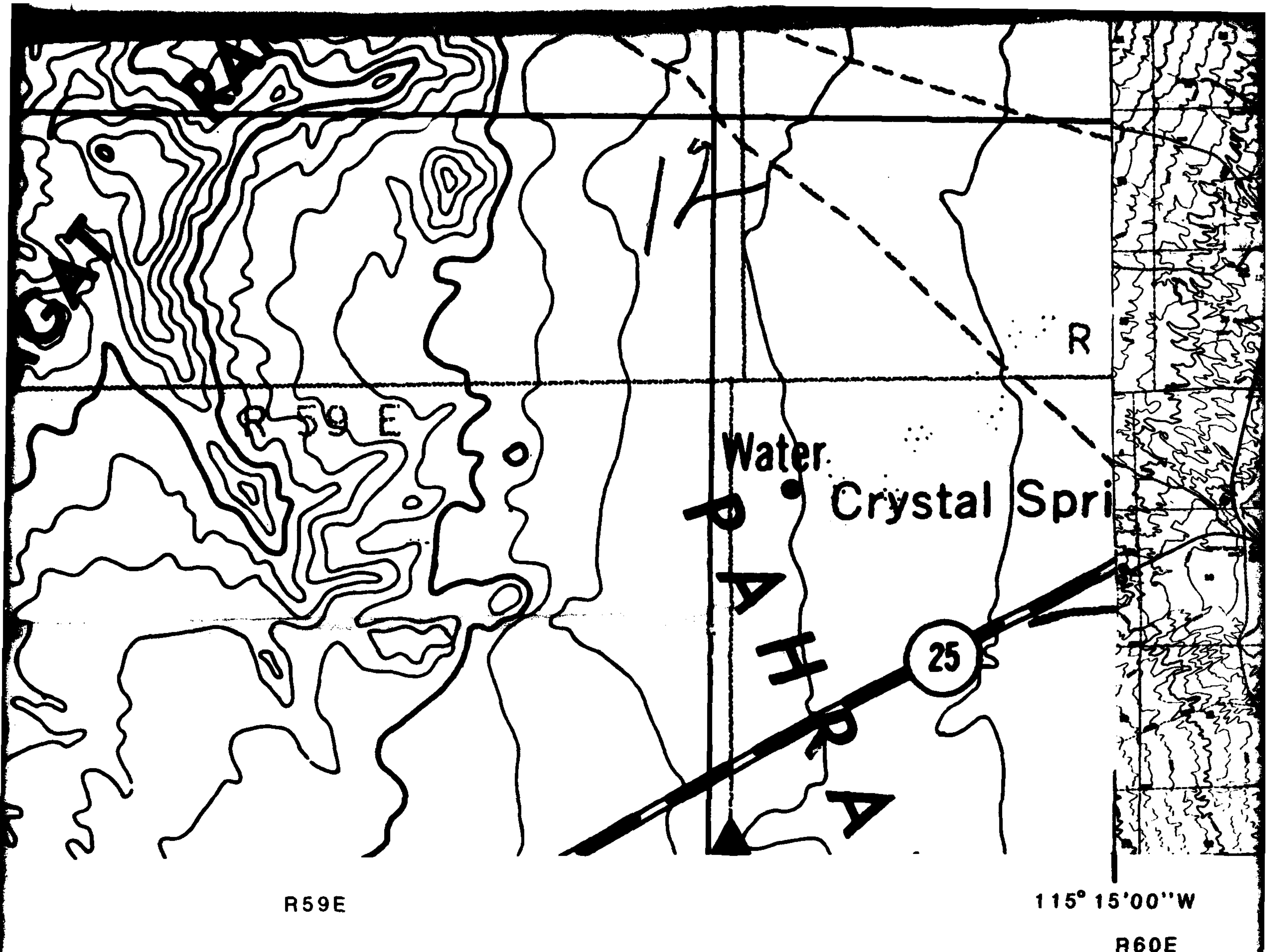
T3S

T4S

15



6
R 58 E
T5S
37°30'00''N
115°30'00''W
R58E
D



INSET

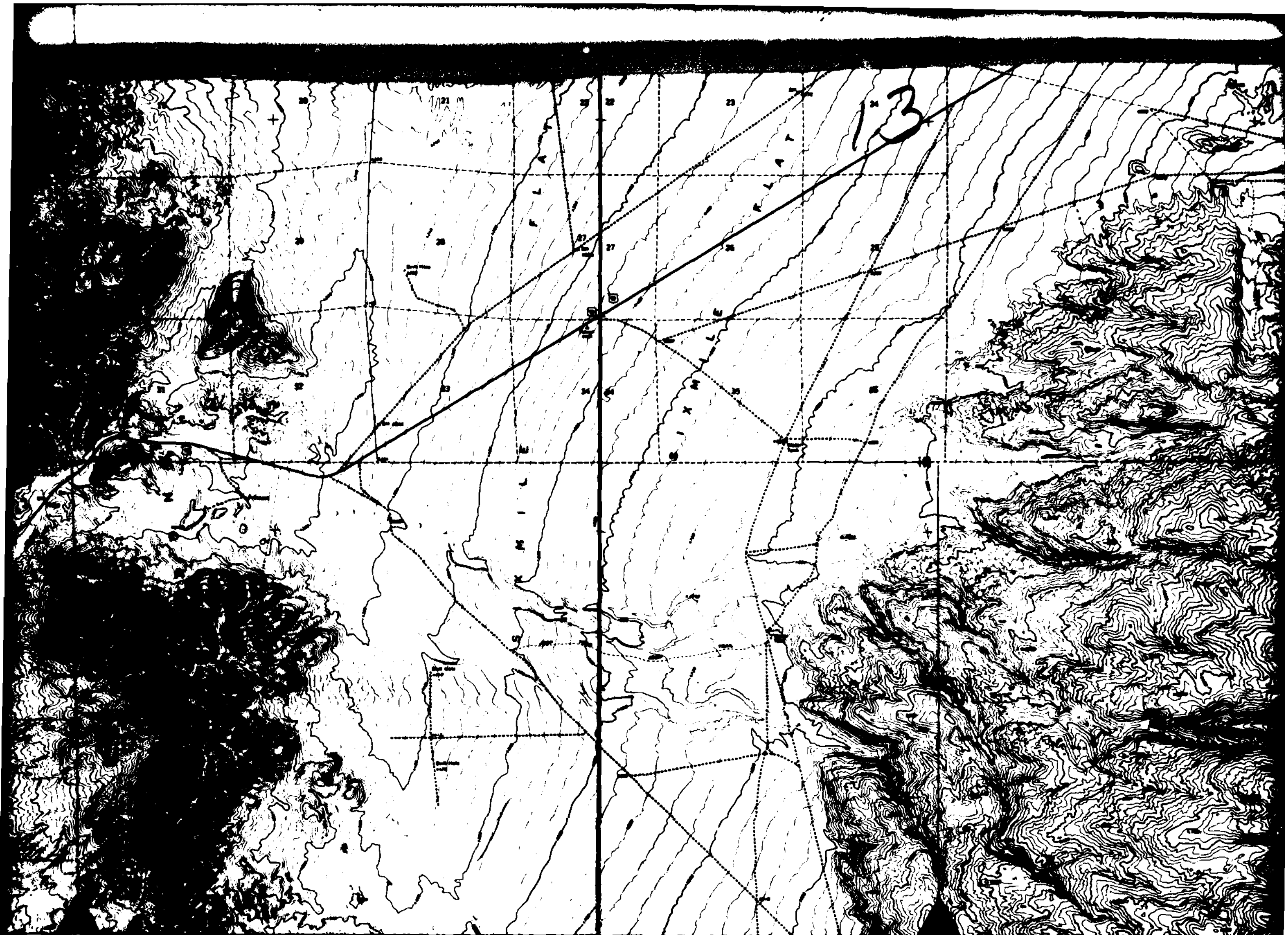
A

A. 7½ MINUTE TOPOGRAPHIC QUADRANGLE, USGS (1:24,000)

B. 15 MINUTE TOPOGRAPHIC QUADRANGLE, USGS (1:62,500)

C. 2 DEGREE TOPOGRAPHIC QUADRANGLE, USGS (1:250,000)

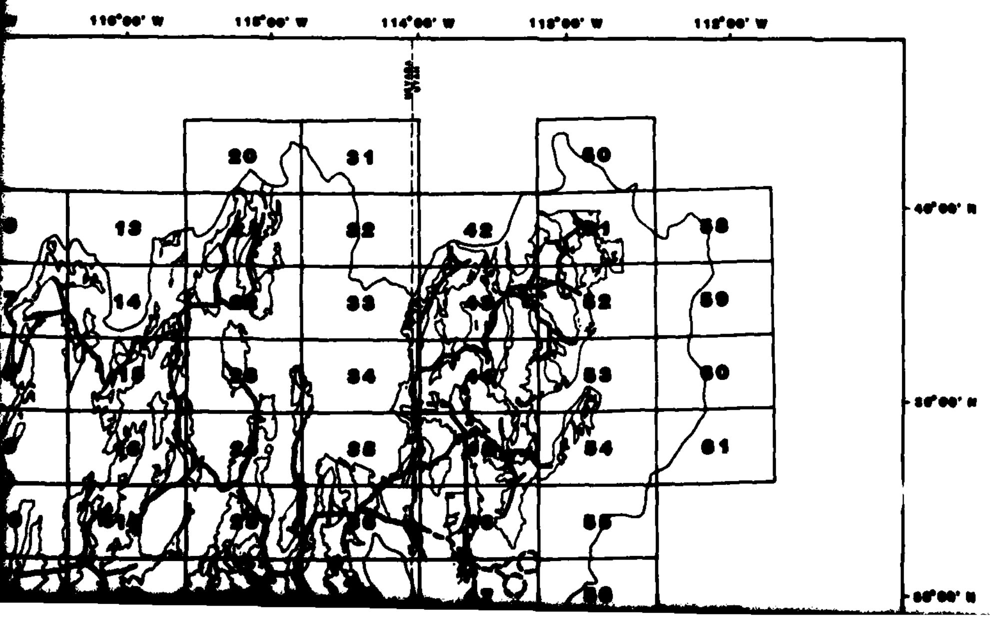
D. COMPILED BY STEREO – PHOTOGRAMMETRIC METHODS BY



R61E

SEE DRAWING #28

MAP SHEET LOCATION

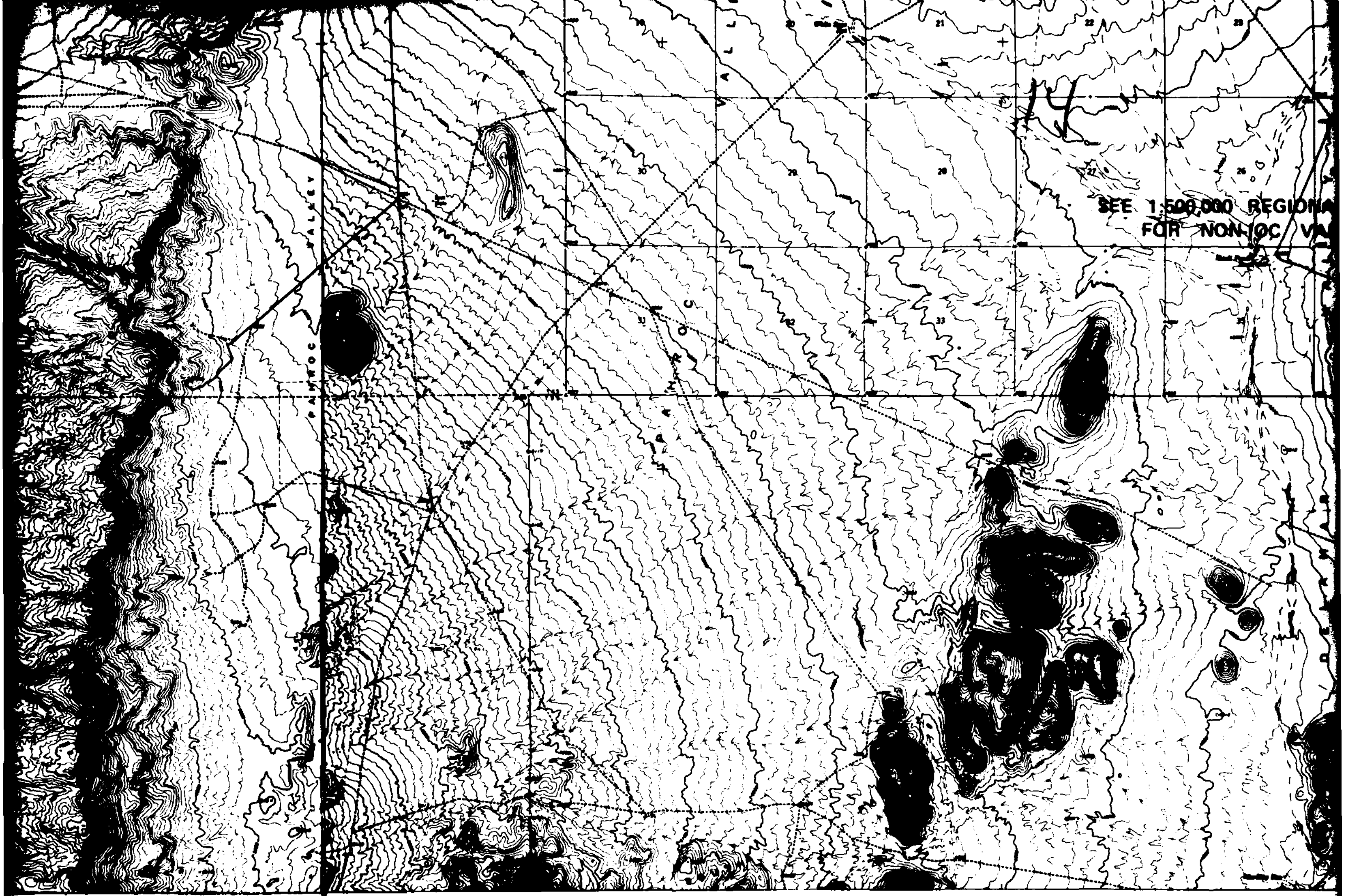


NORTH

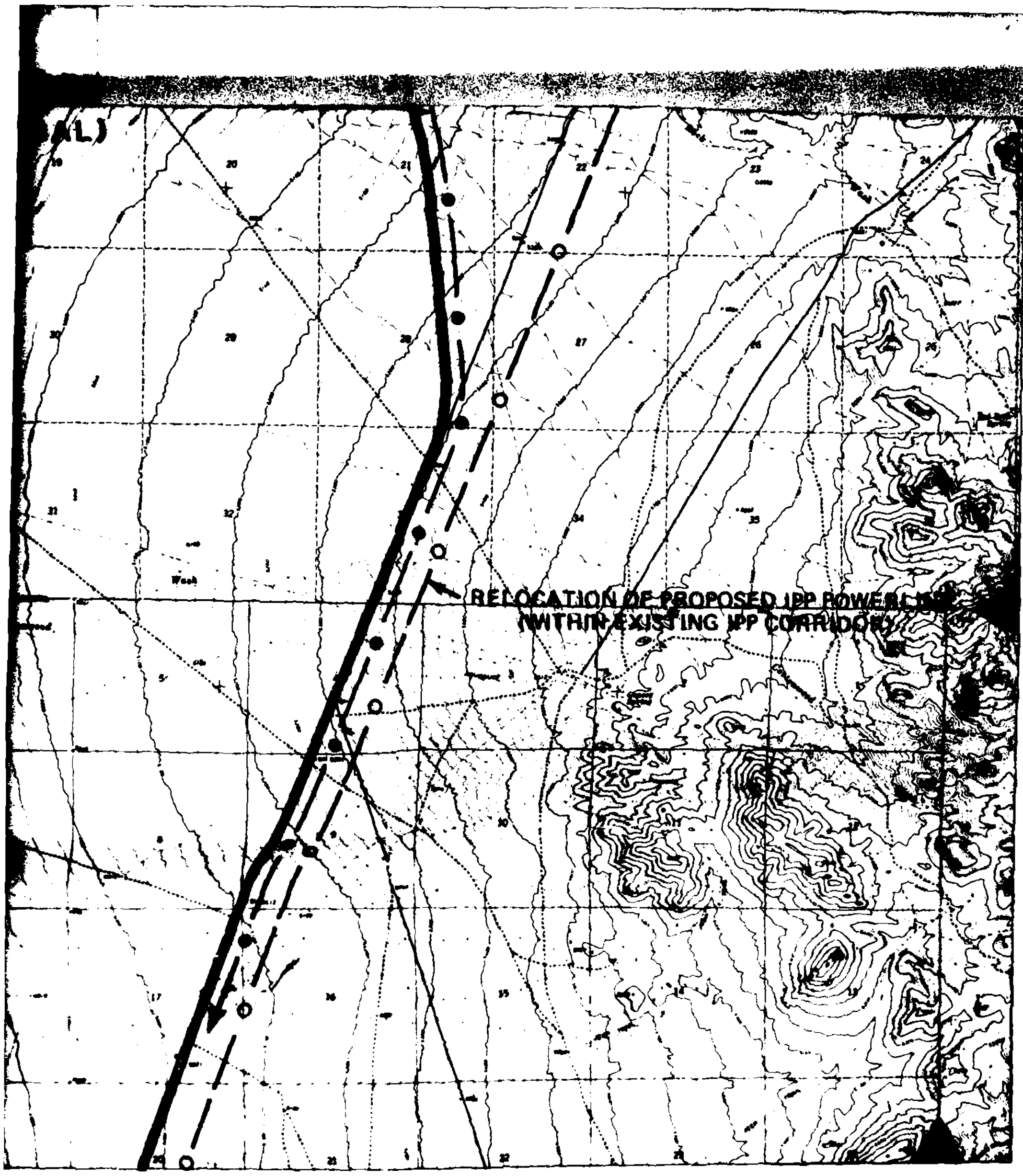
SEE SHEET "A" FOR EXPLANATION OF MAP SYMBOLS

SCALE 1:62,500

0 1 2



R62E 115°00'00"W R63E



15

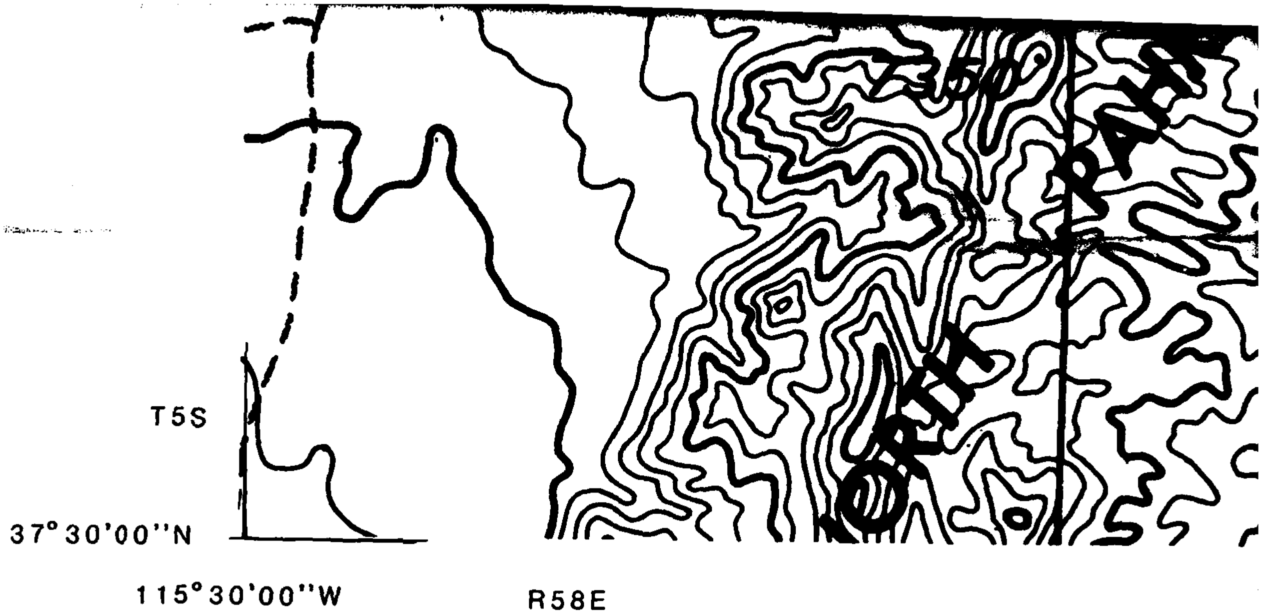
T5S

37° 30'00''N

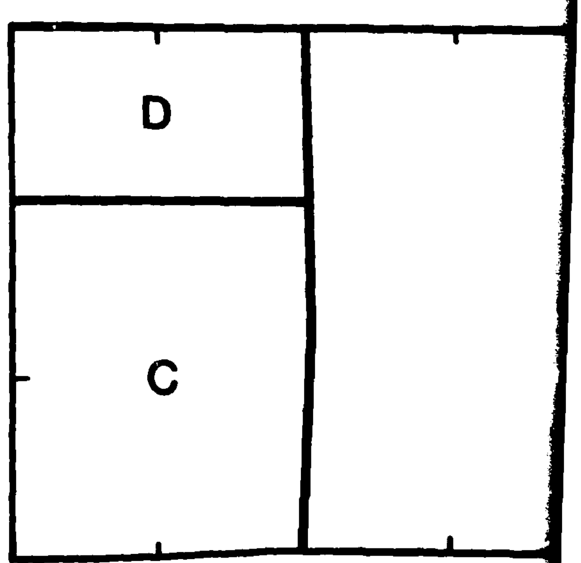
R64E

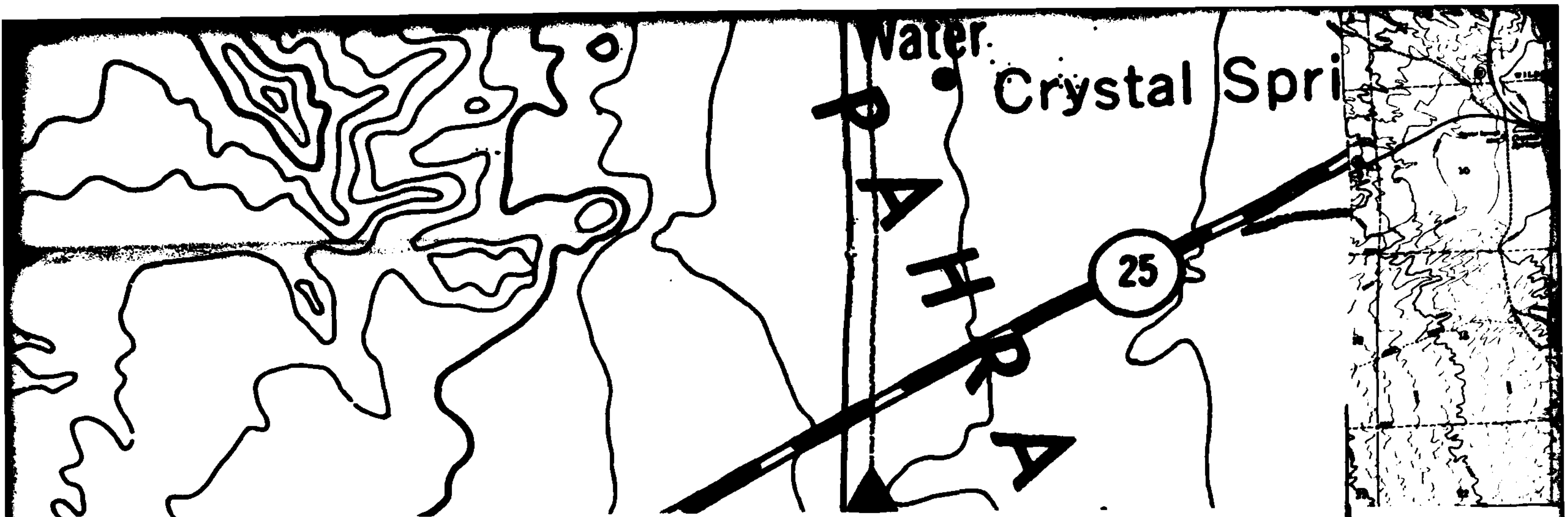
114° 45'00''W

PROJECT MAP SHEET



BASE MAP SOURC





R59E

115° 15'00"W

R60E

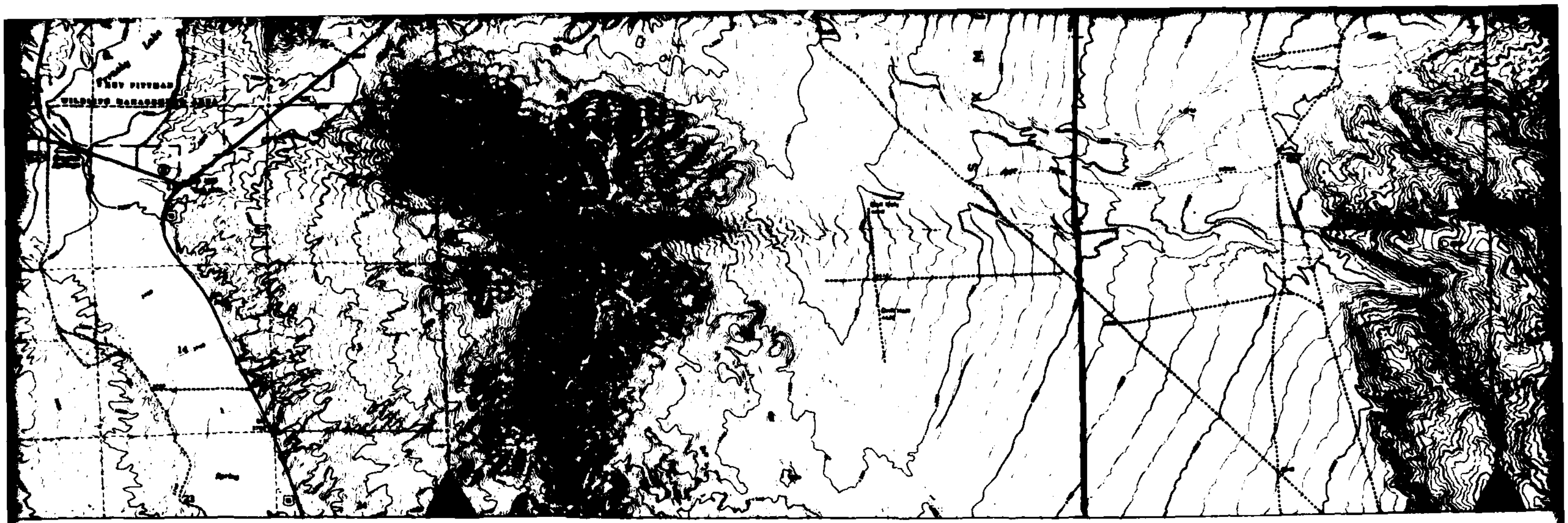
INSET

A. 7½ MINUTE TOPOGRAPHIC QUADRANGLE, USGS (1:24,000)

B. 15 MINUTE TOPOGRAPHIC QUADRANGLE, USGS (1:62,500)

C. 2 DEGREE TOPOGRAPHIC QUADRANGLE, USGS (1:250,000)

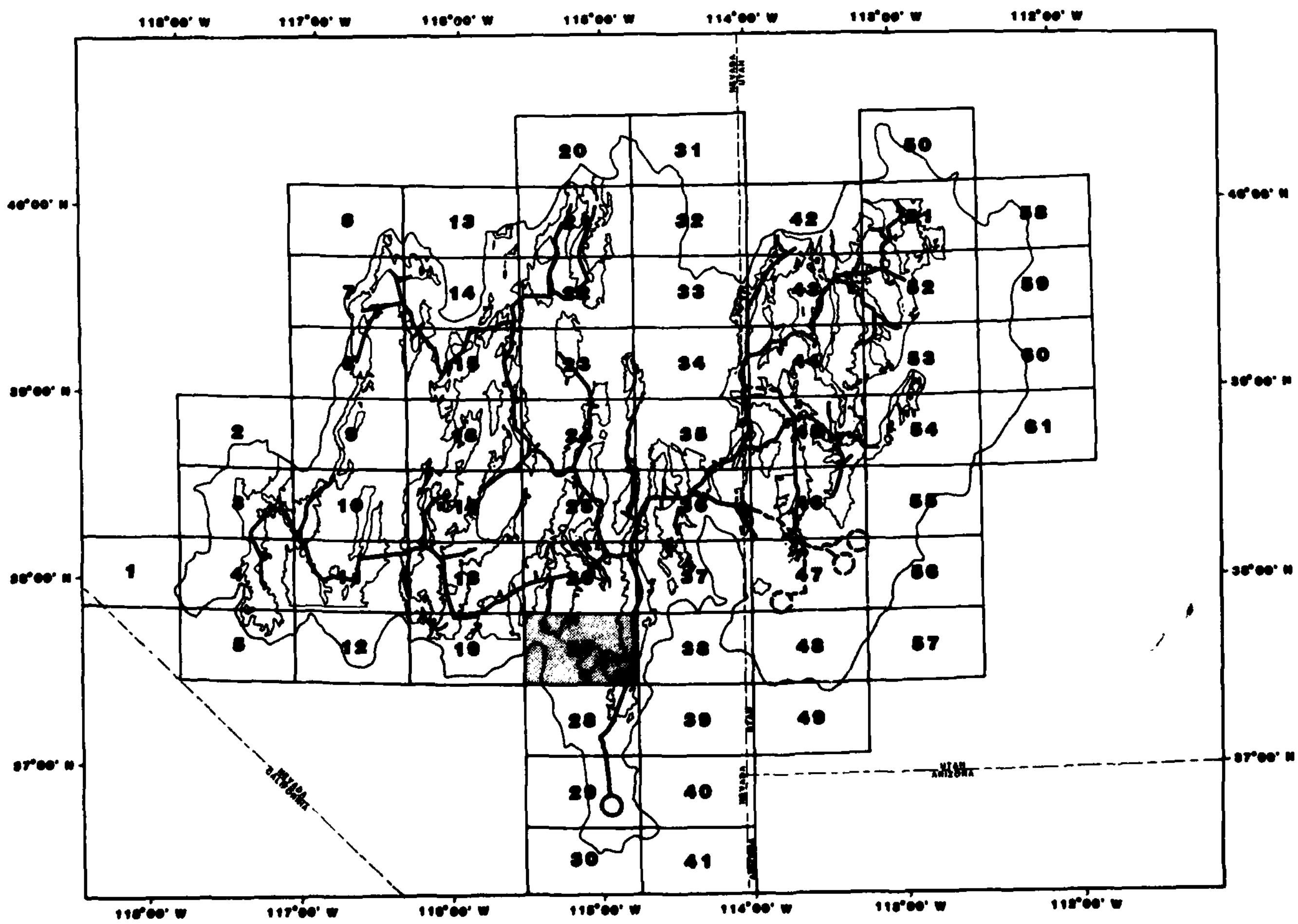
D. COMPILED BY STEREO – PHOTOGRAMMETRIC METHODS BY ERTEC AIRBORNE SYSTEMS (FORMERLY FUGRO GEOMETRICS) AT 1:62,500



R61E

SEE DRAWING #

MAP SHEET LOCATION



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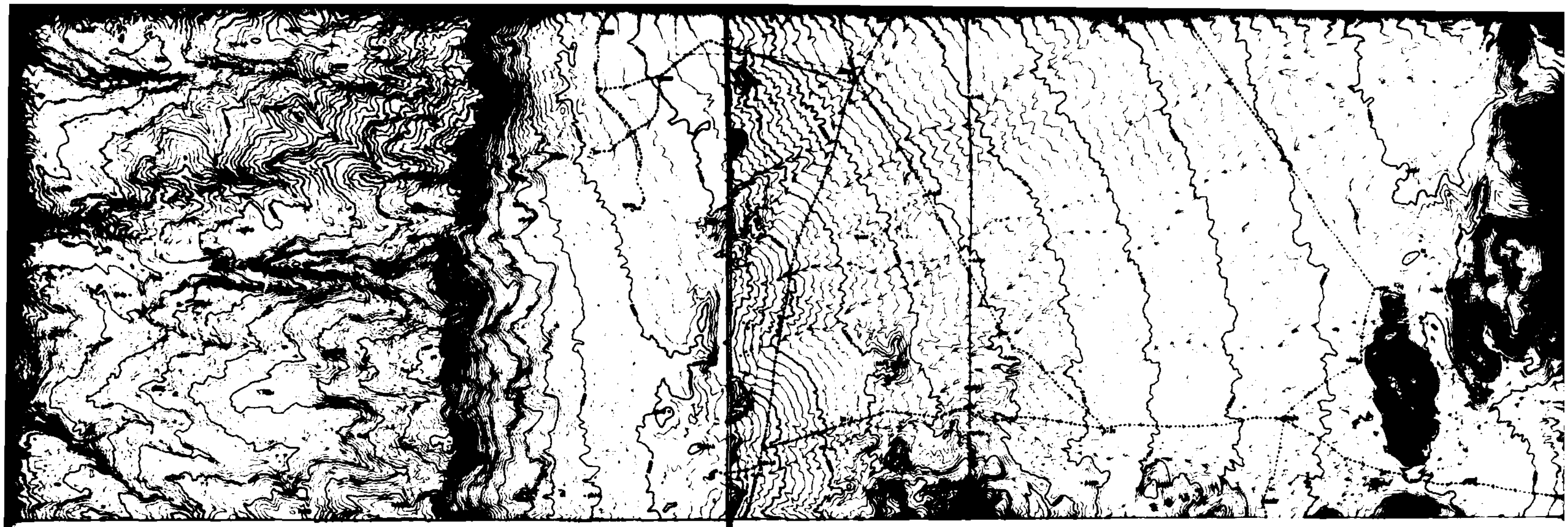


R62E 115° 00'00"W R63E

28

NORTH

SHEET "A"
XPLANATION
P SYMBOLS

LE 1:62,500

1 2
TUTE MILES

1 2
LOMETERS

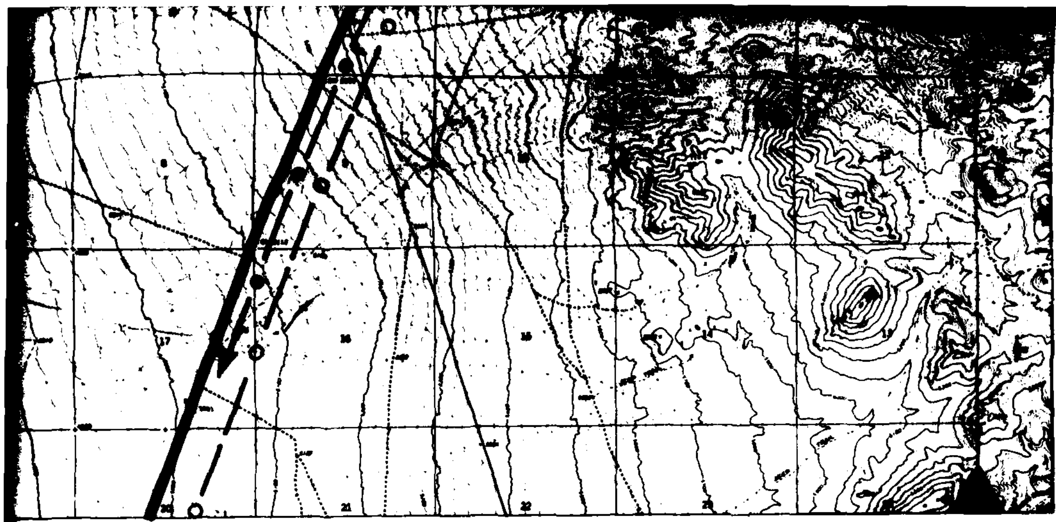
REVISION	DATE	DESCRIPTION
1	10/1/81	REVISED NOTE, ADDED POWERLINE

REVISIONS

STATE: NEVADA	RAILROADS: NO
COUNTY: LINCOLN	STATE ROADS:
LOCAL COMMUNITY: NONE	FEDERAL ROA

DEPARTMENT OF THE AIR FO
AIR FORCE REGIONAL CIVIL ENGINEE
NORTON AIR FORCE BASE, CA 9

SIGNATURE	DATE
DRAWN BY: C. T. Kay CHECKED BY: O. Levinson	9/17/81



PROJECT MAP SHEET

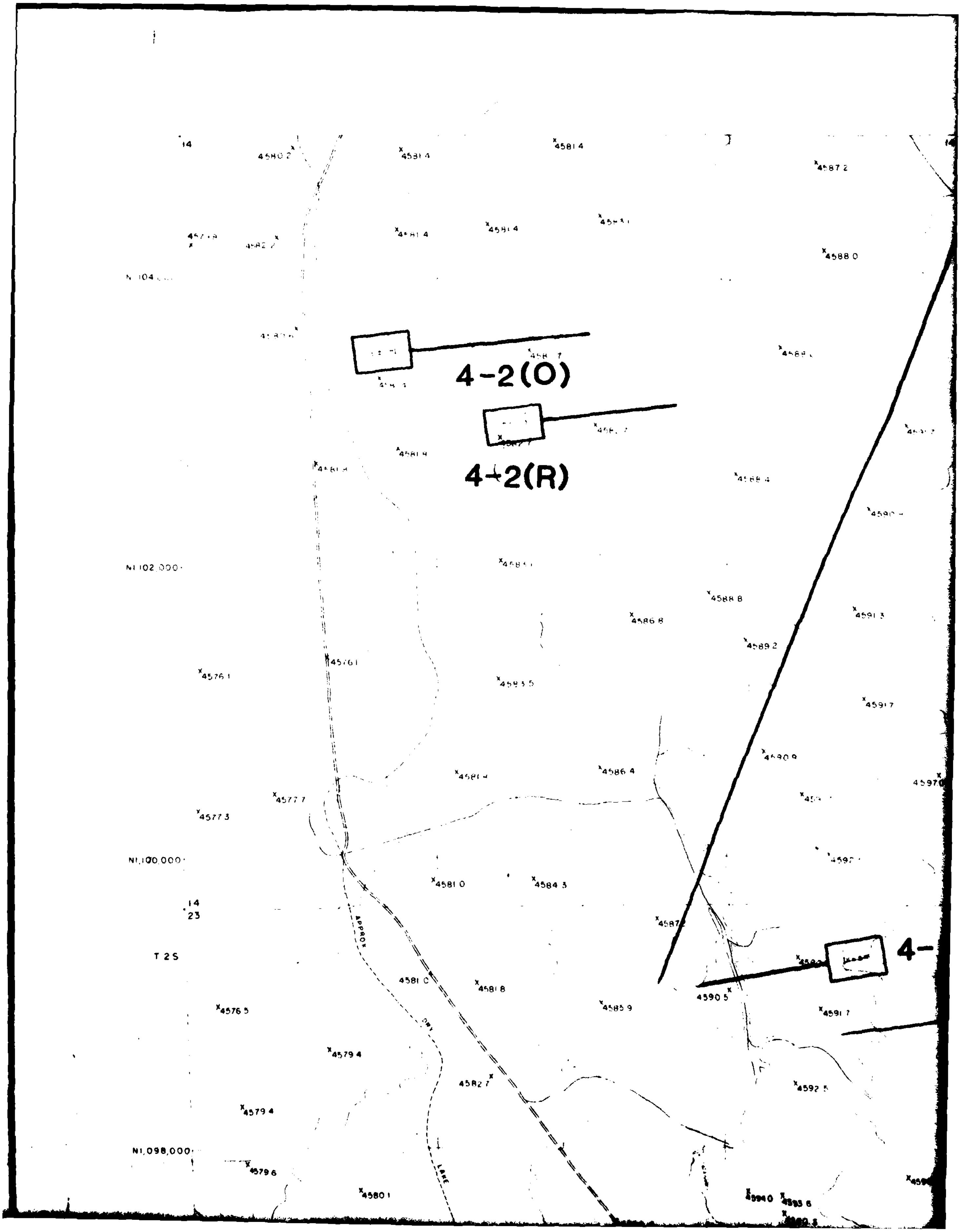
STATE: NEVADA	RAILROADS: NONE
COUNTY: LINCOLN	STATE ROADS: HWYS 38, 25
LOCAL COMMUNITY: NONE	FEDERAL ROADS: HWY 93

DEPARTMENT OF THE AIR FORCE
AIR FORCE REGIONAL CIVIL ENGINEER - MX
NORTON AIR FORCE BASE, CA 92409

SIGNATURE	DATE
DRAWN BY: C Kay CHECKED BY: Harrison	9/17/81
GEOTECHNICAL: Stanley Madsen	9/17/81
SITING: F G Snyder	9/17/81
ENVIRONMENTAL:	

DRY LAKE VALLEY, NEVADA

5200-FOOT 2/3 FILLED HEXAGONAL MPS LAYOUT
MX SYSTEM PROPOSED LAND REQUIREMENTS FOR NEVADA/UTAH



4-2(O)
4-2(R)
4-
N1,102,000
N1,100,000
N1,098,000
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APPROX
DRY
LAKE
4581.4
4587.2
4588.0
4586.8
4588.8
4591.3
4589.2
4576.1
4591.7
4590.9
4586.4
4577.7
4577.3
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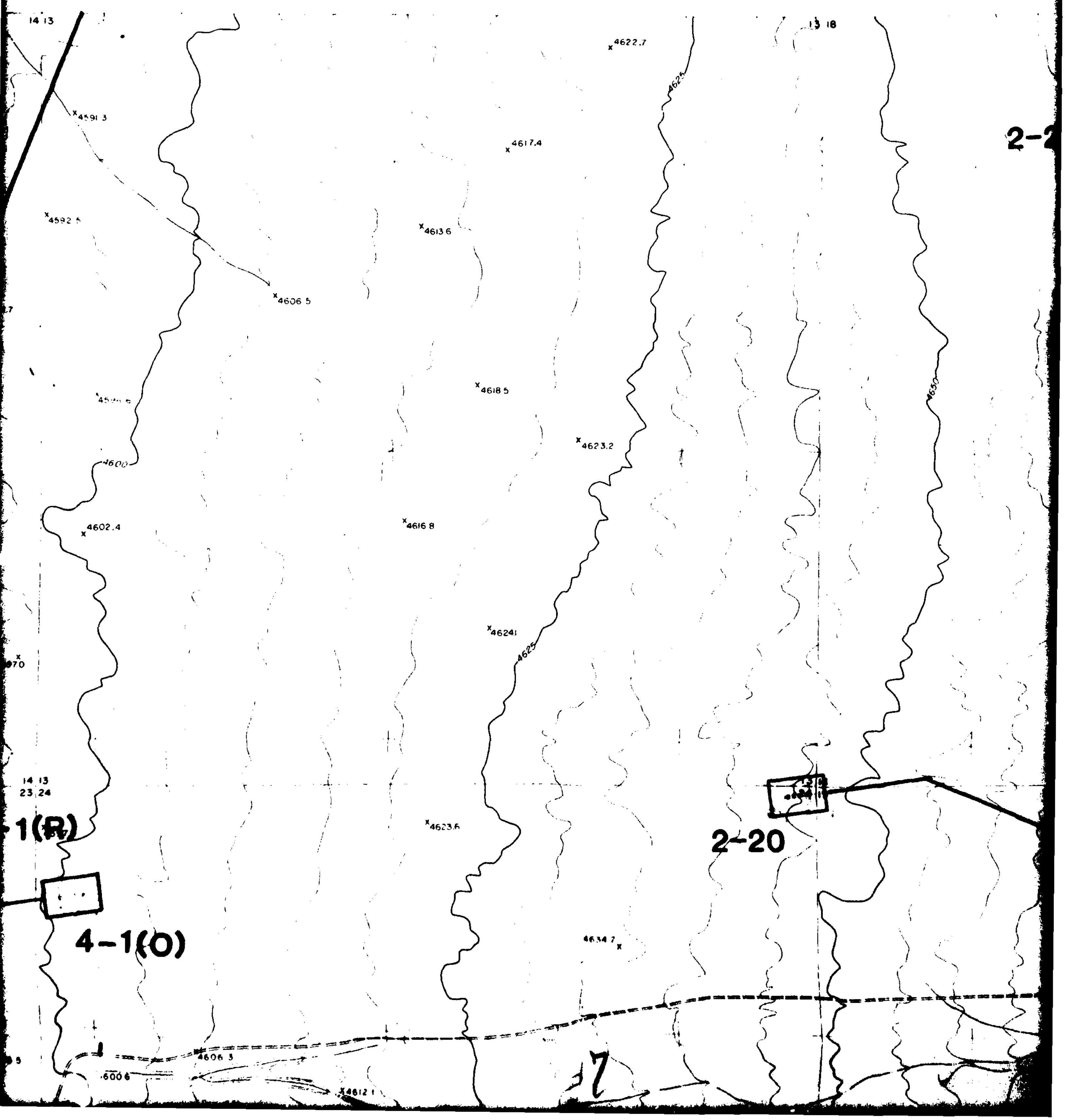
4579.6
4580.1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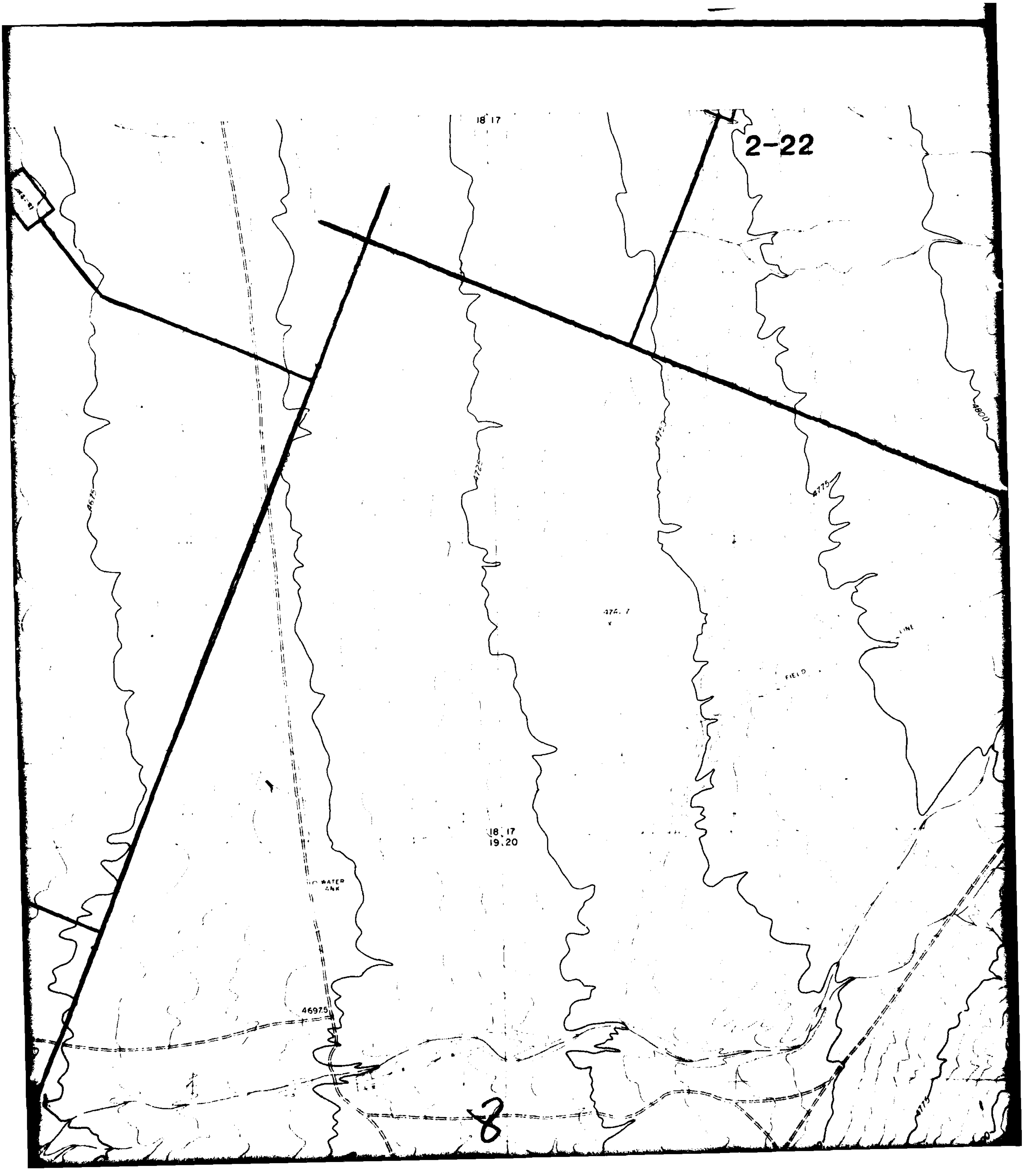
4634.7
4606.3
4600.6
4612.1

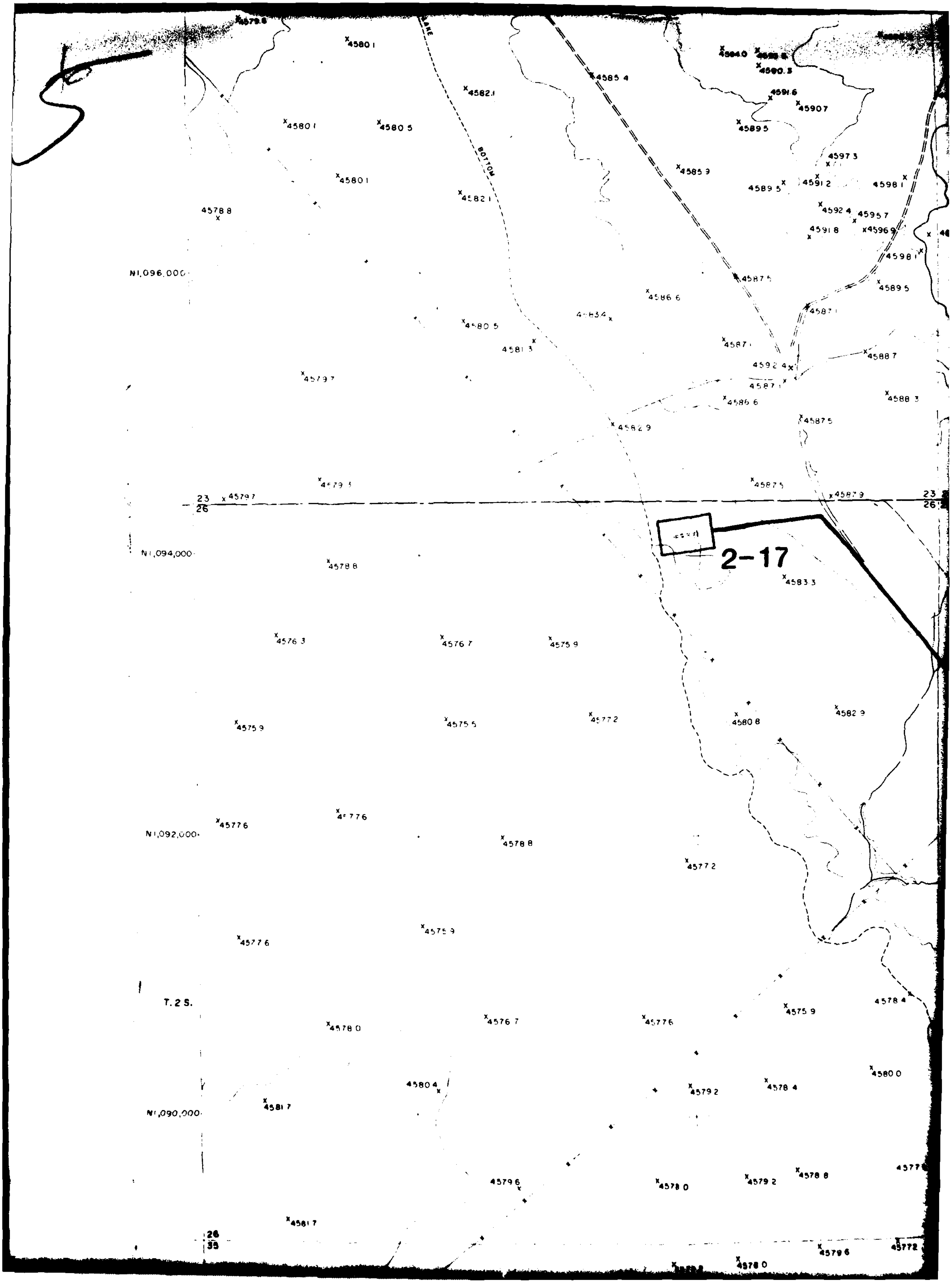

2-22
18 17
4675
4725
4750
4775
4800
474.7
FIELD
LINE
18 17
19 20
WATER
ANK
4697.5
8

THIS MAP WAS COMPILED BY STEREO-PHOTOGRAMMETRIC MET
UNDER PROJECT NO. 79-290, USING THE KERN PG 2/AT/DC2
STEREO SYSTEM FROM AERIAL PHOTOGRAPHY DATED SEPT. 8

BASIS OF COORDINATES:
NEVADA STATE PLANE SYSTEM, ZONE: E

BASIS OF ELEVATION: MEAN SEA LEVEL

SHEET INDEX



2-17
T. 2 S.
N1,096,000
N1,094,000
N1,092,000
N1,090,000
23
26
26
35
BOTTOM
4580.1
4582.1
4580.5
4585.4
4590.3
4591.6
4590.7
4589.5
4585.9
4589.5
4591.2
4598.1
4578.8
4592.4
4595.7
4591.8
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4598.1
4587.5
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4587.1
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4588.3
4582.9
4587.5
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4579.7
4587.9
4583.3
4576.3
4576.7
4575.9
4575.5
4577.2
4580.8
4582.9
4577.6
4578.8
4577.2
4578.0
4576.7
4578.4
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4578.8
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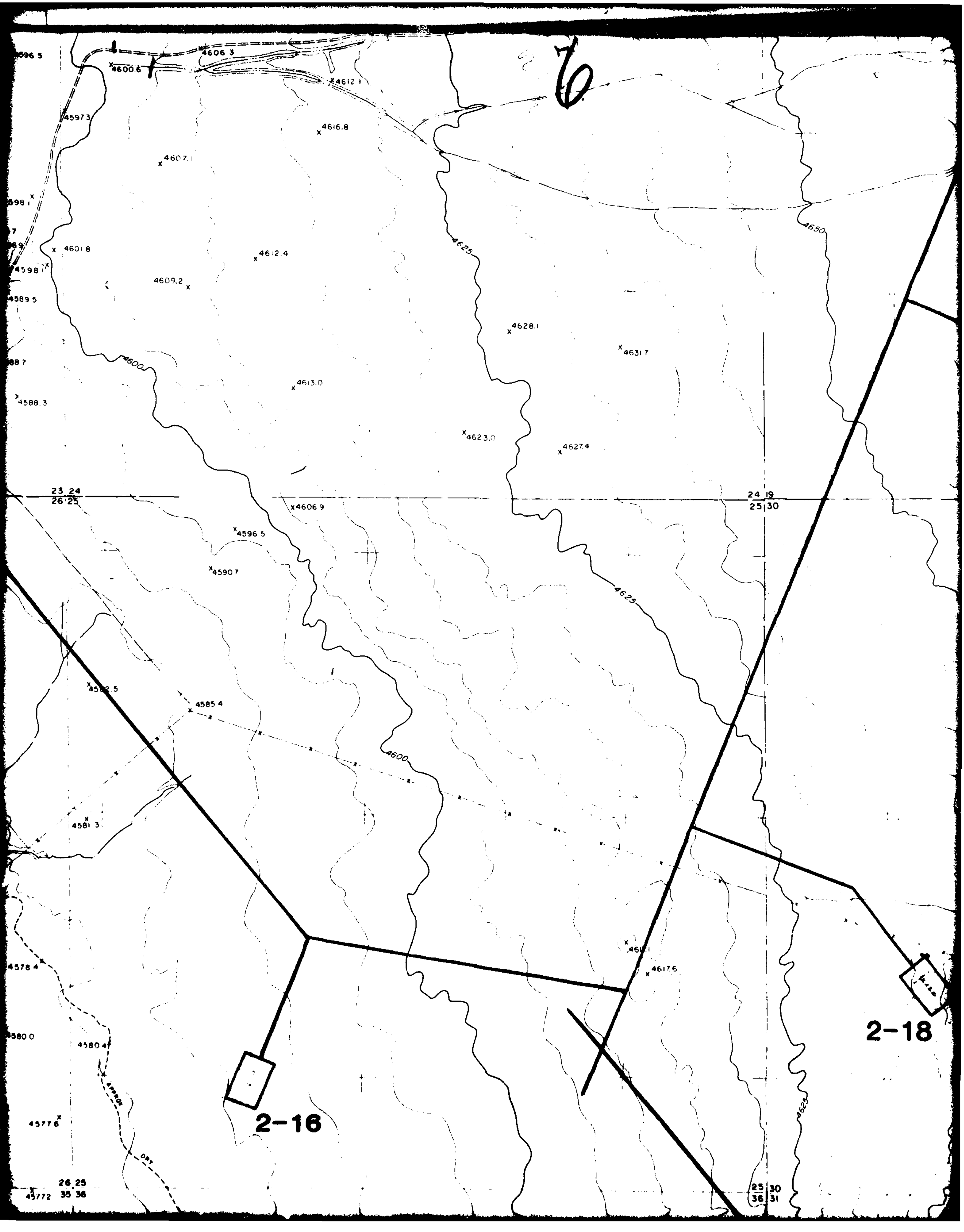
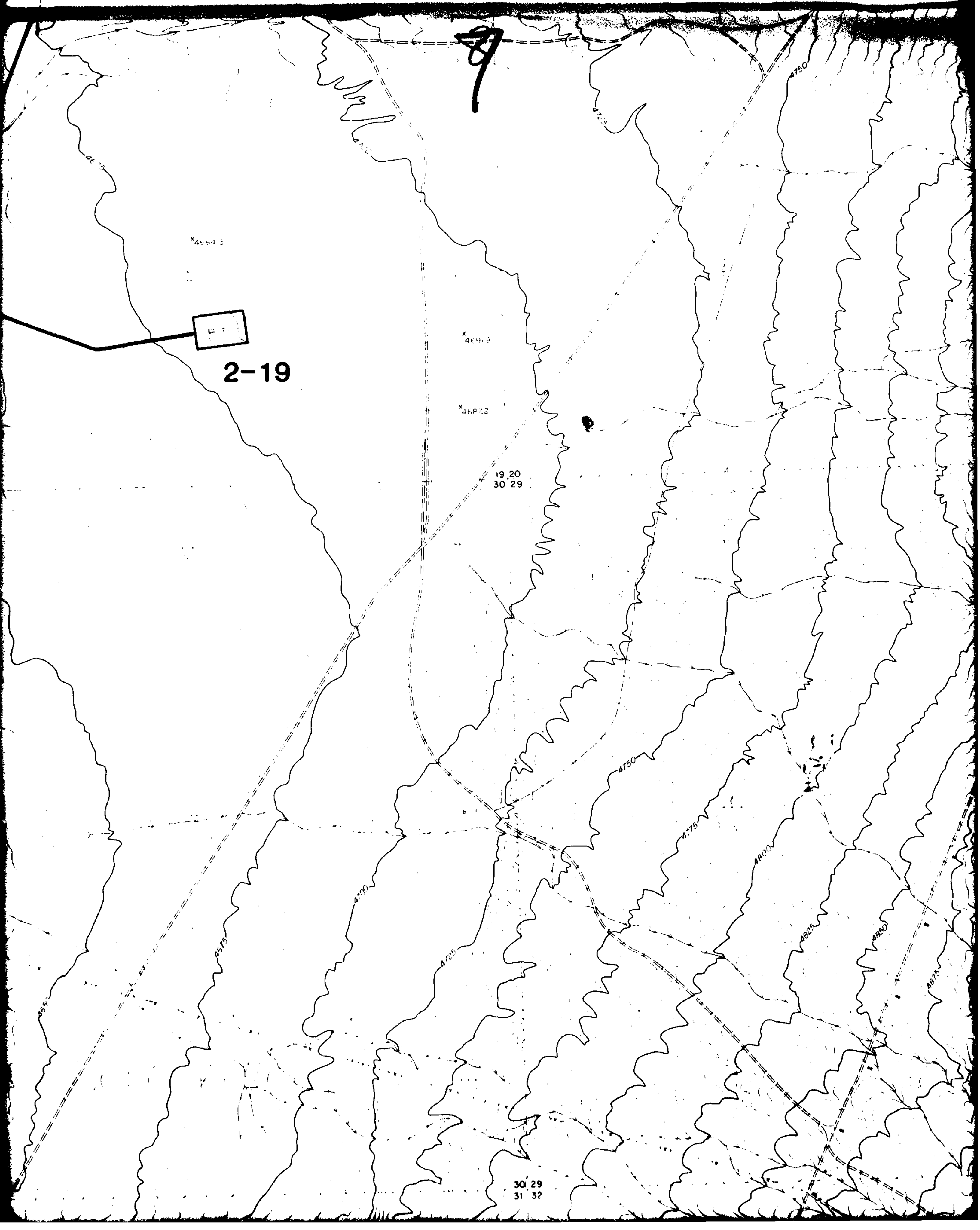
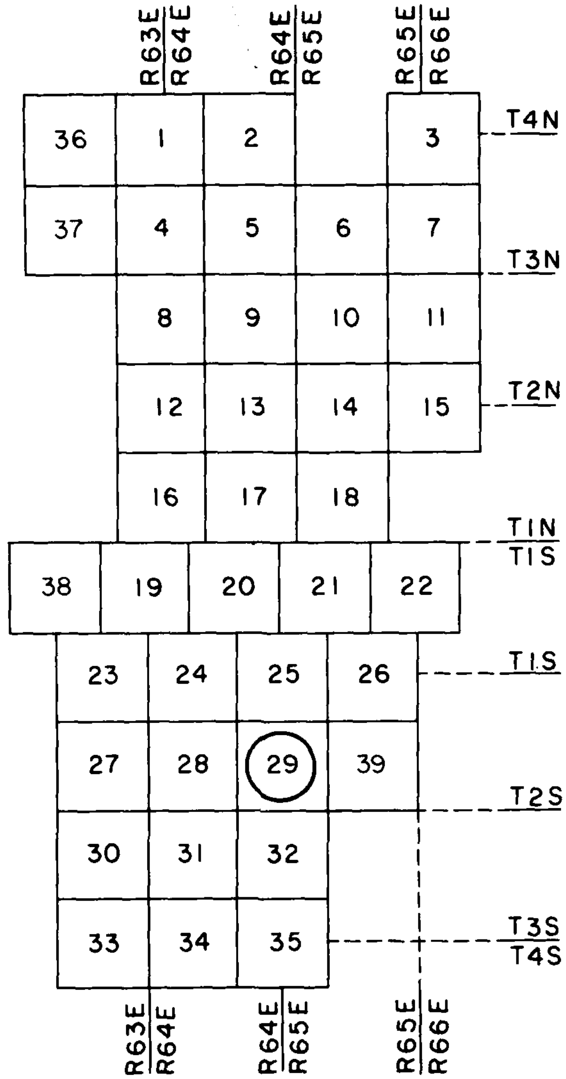
4577.2


76
4606.3
4600.6
4612.1
4616.8
4597.3
4607.1
4598.1
4601.8
4612.4
4598.1
4609.2
4589.5
4625
4650
4628.1
4631.7
4600
4613.0
4588.3
4623.0
4627.4
23 24
26 25
24 19
25 30
4606.9
4596.5
4590.7
4625
4585.4
4600
4581.3
4617.6
4578.4
4580.0
4580.4
APPROX
DRY
4577.6
2-16
2-18
4625
26 25
35 36
4577.2
25 30
36 31


2-19
19 20
30 29
4750
4775
4800
4825
4850
4725
4575
30 29
31 32

8

SHEET INDEX



(O) = ORIGINAL SHELTER SITE

(R) = RESITED SHELTER SITE

--- = ORIGINAL ROAD

—— = RESITED ROAD

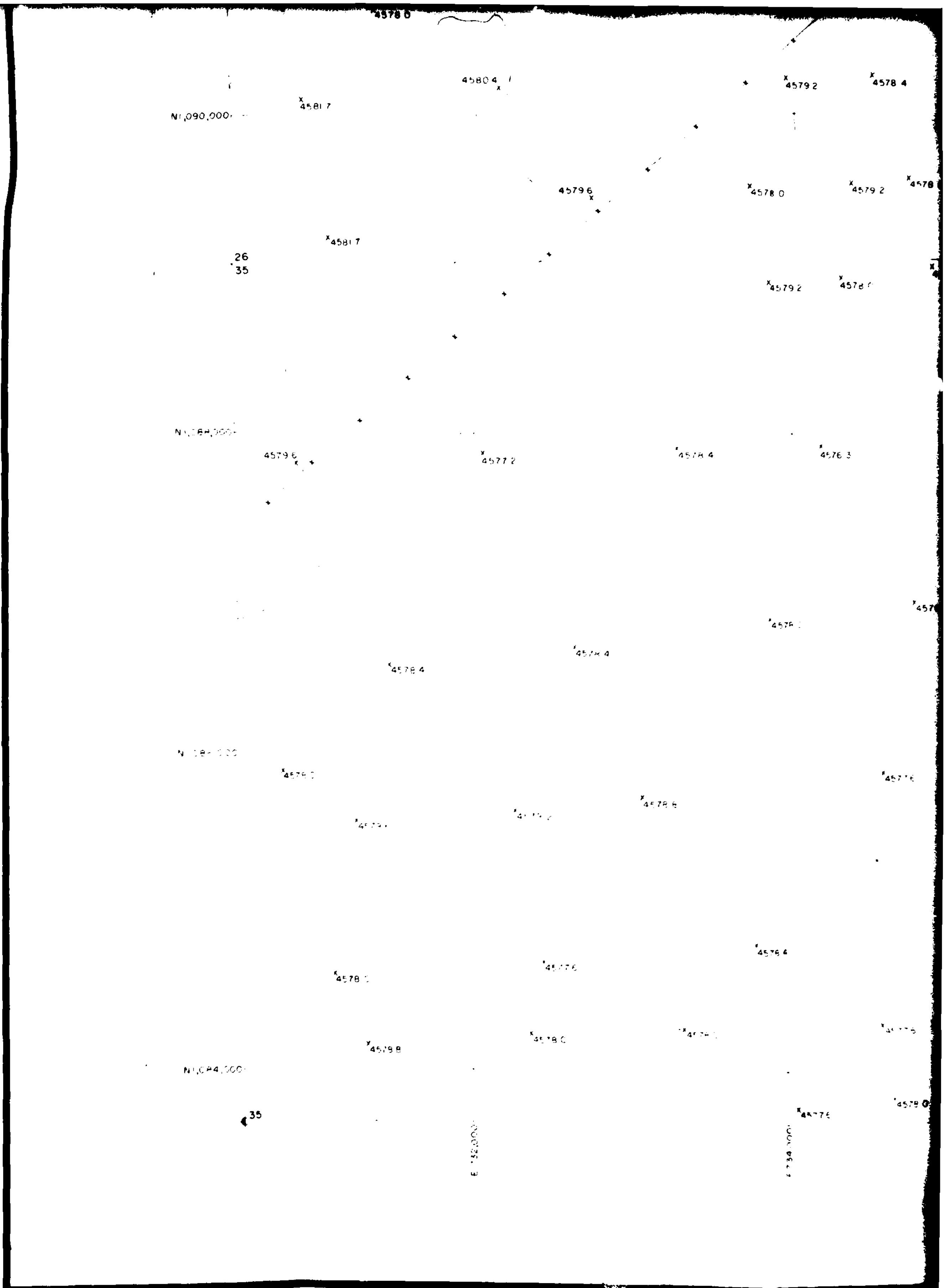
● = FOUND 3 1/2" BRASS CAP SET ON 2 1/2" IRON PIPE. U.S. DEPARTMENT OF THE INTERIOR. BUREAU OF LAND MANAGEMENT. (SURVEYED POSITION.)

◐ = FOUND 3 1/2" BRASS CAP SET ON 2 1/2" IRON PIPE. U.S. DEPARTMENT OF THE INTERIOR. BUREAU OF LAND MANAGEMENT. (CALCULATED)

⊙ = NOT SEARCHED (CALCULATED POSITION ONLY.)

△ = TRIANGULATION STATION.

= PROJECTED POSITION (CALCULATED.)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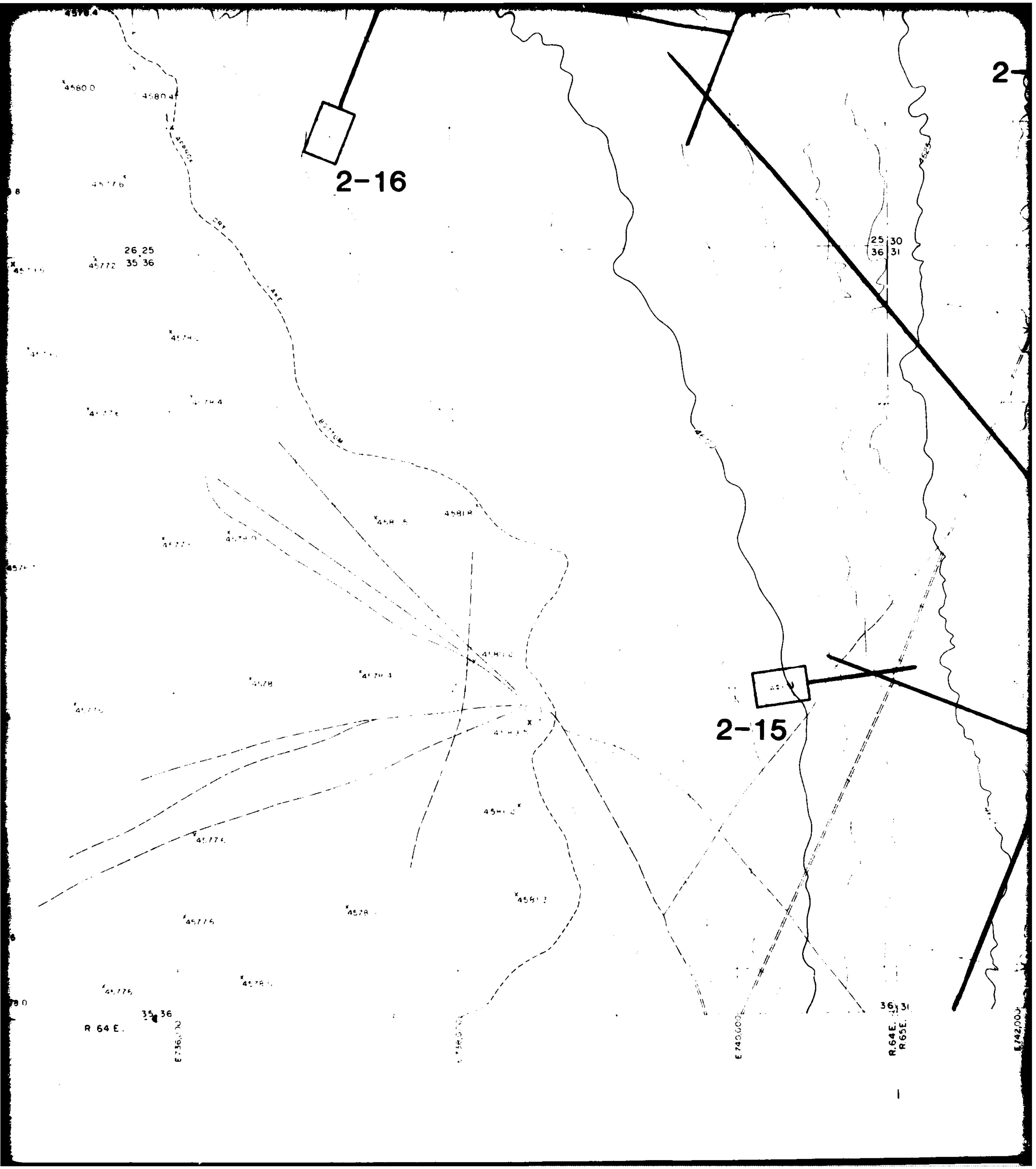
4580.4
4581.7
N1,090,000
4579.2
4578.4
4579.6
4578.0
4579.2
4581.7
26
35
4579.2
4579.6
4577.2
4576.3
4578.4
4578.4
4579.8
35

30 NOV 81



2-16
2-15
2-
25 30
36 31
26 25
35 36
36 31
35 36
R 64 E.
R.64 E.
R.65 E.
E 740,000
E 742,000
4580.0
4580.4
4581.8
45772
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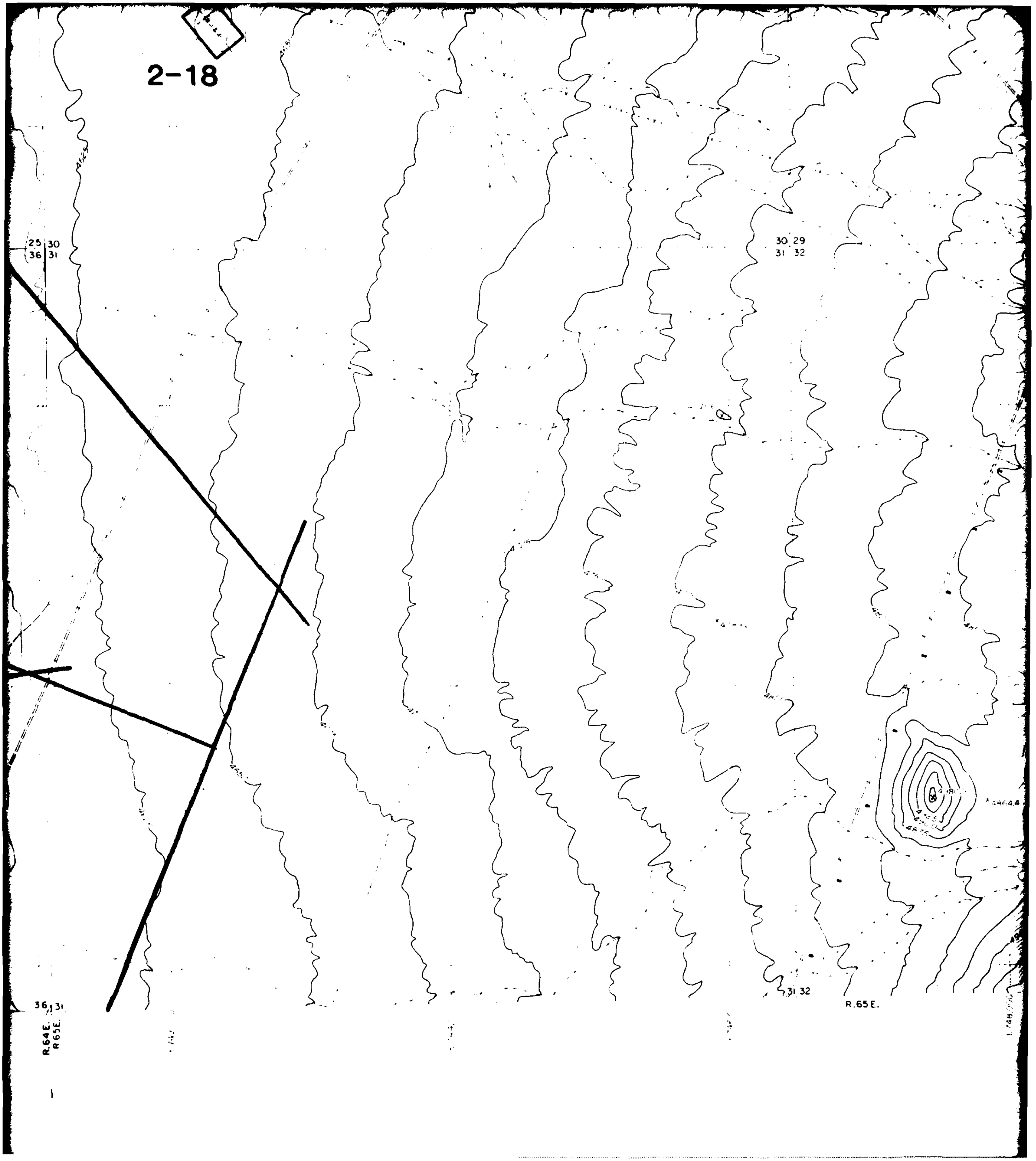
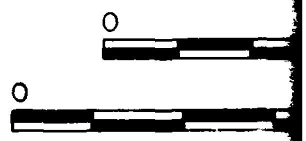
45776
45774
45812
4578.4



2-18
25 30
36 31
30 29
31 32
31 32
36 31
R.64E.
R.65E.
R.65E.



REVISION NO. DA

DESIGNED BY

DRAWN BY

CHECKED BY

SUBMITTED BY

APPROVED

U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF
LAND MANAGEMENT. (SURVEYED POSITION.)

= FOUND 3 1/2" BRASS CAP SET ON 2 1/2" IRON PIPE.
U.S. DEPARTMENT OF THE INTERIOR. BUREAU OF
LAND MANAGEMENT. (CALCULATED)

= NOT SEARCHED (CALCULATED POSITION ONLY.)

= TRIANGULATION STATION.

= PROJECTED POSITION (CALCULATED.)

SCALE 1:9,600

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0 1/4 1/2 1 STATUTE MILE

0 1/4 1/2 1 NAUTICAL MI

CONTOUR INTERVAL 5 FEET

REVISION NO.	DATE	DESCRIPTION	AGENCY

FUGRO GEOMETRICS, INC.
PHOTOGRAMMETRISTS
3200 EAST 27TH STREET, LONG BEACH CA 90806

DEPARTMENT OF THE AIR FOR
BALLISTIC MISSILE OFFICE (AFSC)
NORTON AIR FORCE BASE, CALIFORNI

DESIGNED BY

DRAWN BY

CHECKED BY

SUBMITTED BY DATE

MX GEOTECHNICAL SITING STUDIES

DRY LAKE VALLEY

APPROVED DATE

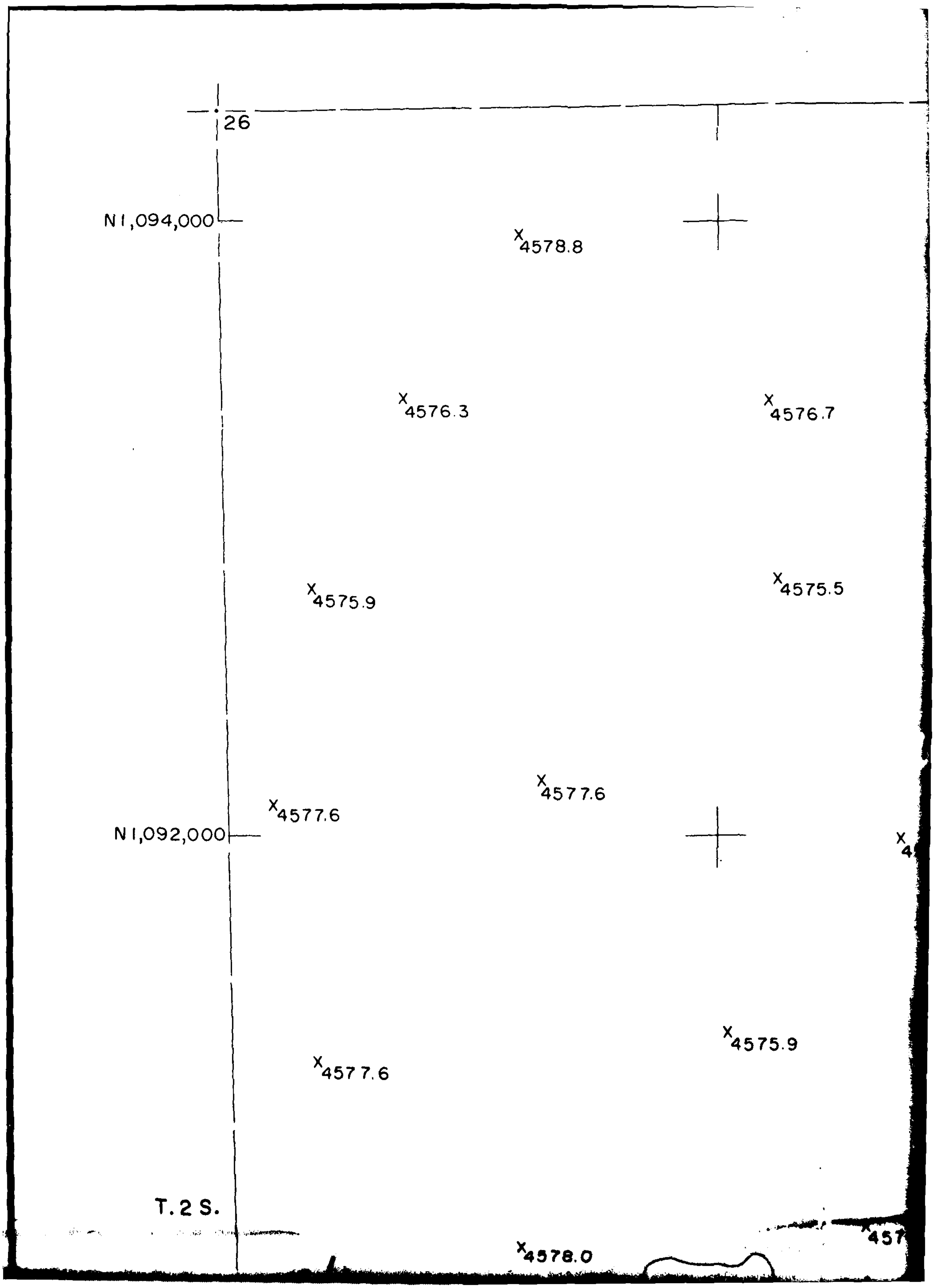
SPECIFICATION NO.

DATE

SCALE

DRAWING NUMBER

SHEET OF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T. 2 S.
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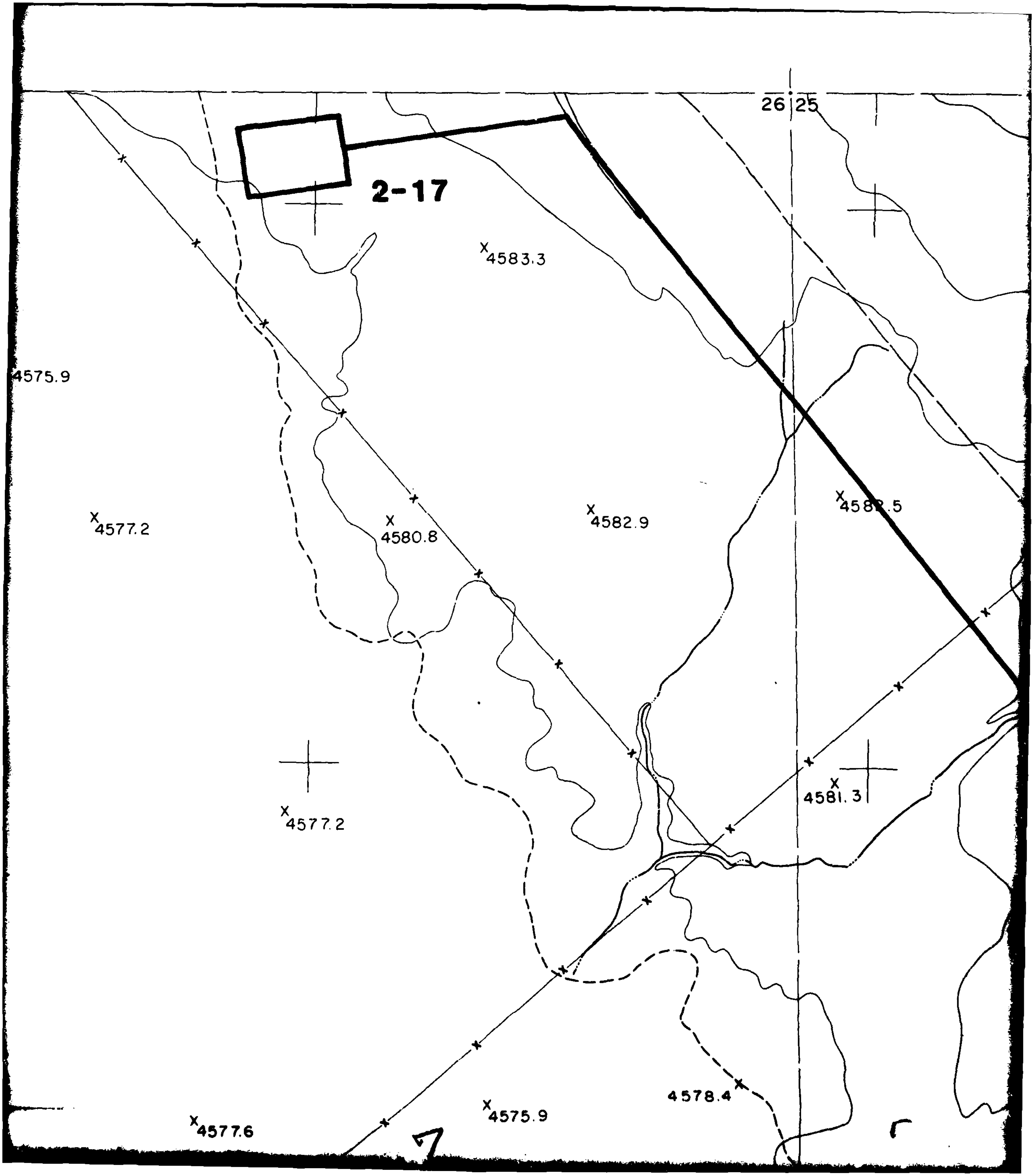

26 25
2-17
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4577.2
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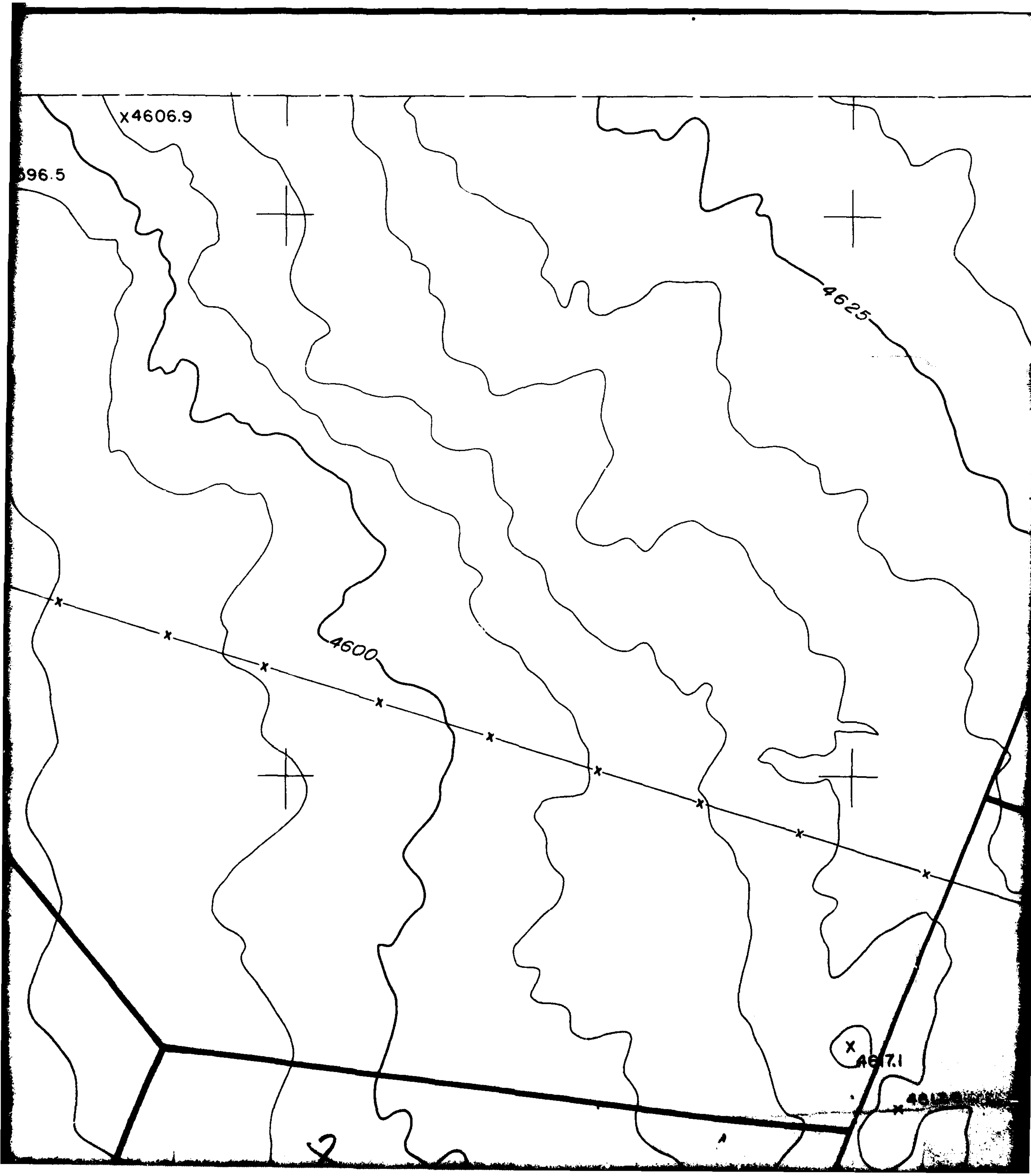
4577.6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596.5
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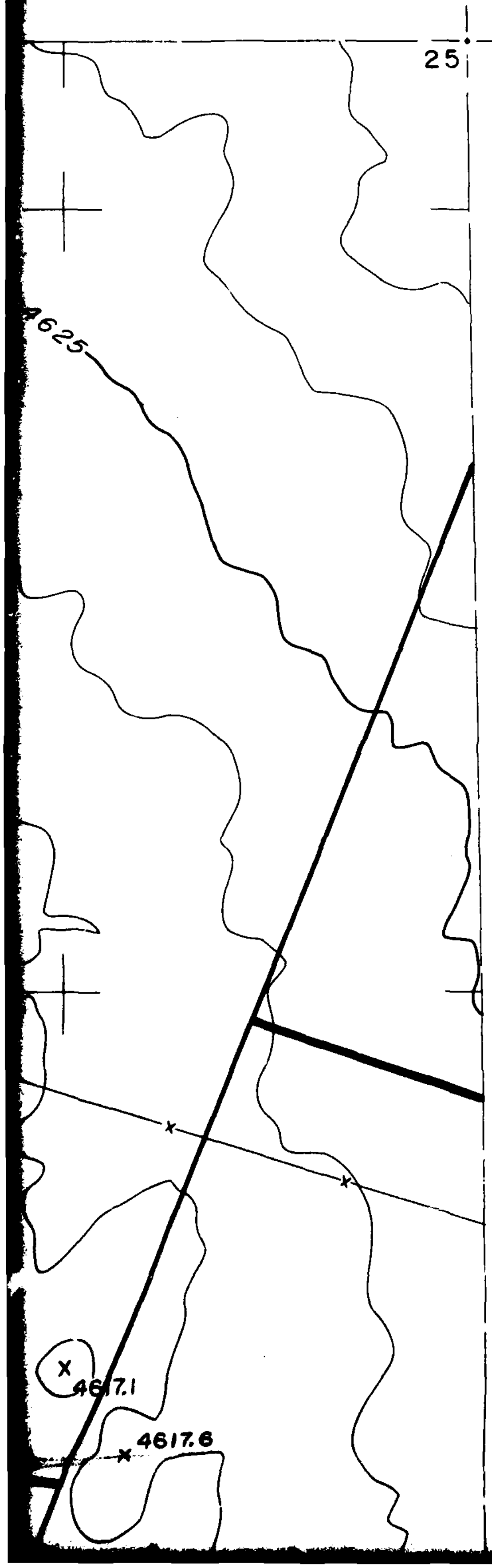
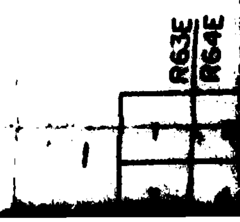


THIS MAP WAS COMPILED
UNDER PROJECT NO. 78-2
STEREO SYSTEM FROM AE

BASIS OF COO
NEVADA STAT

BASIS OF EL



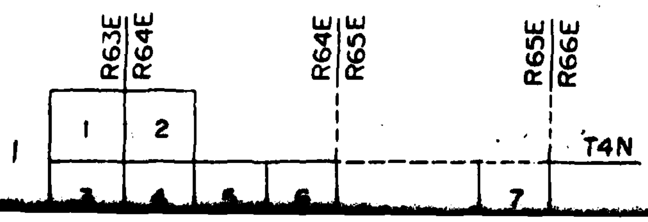
9

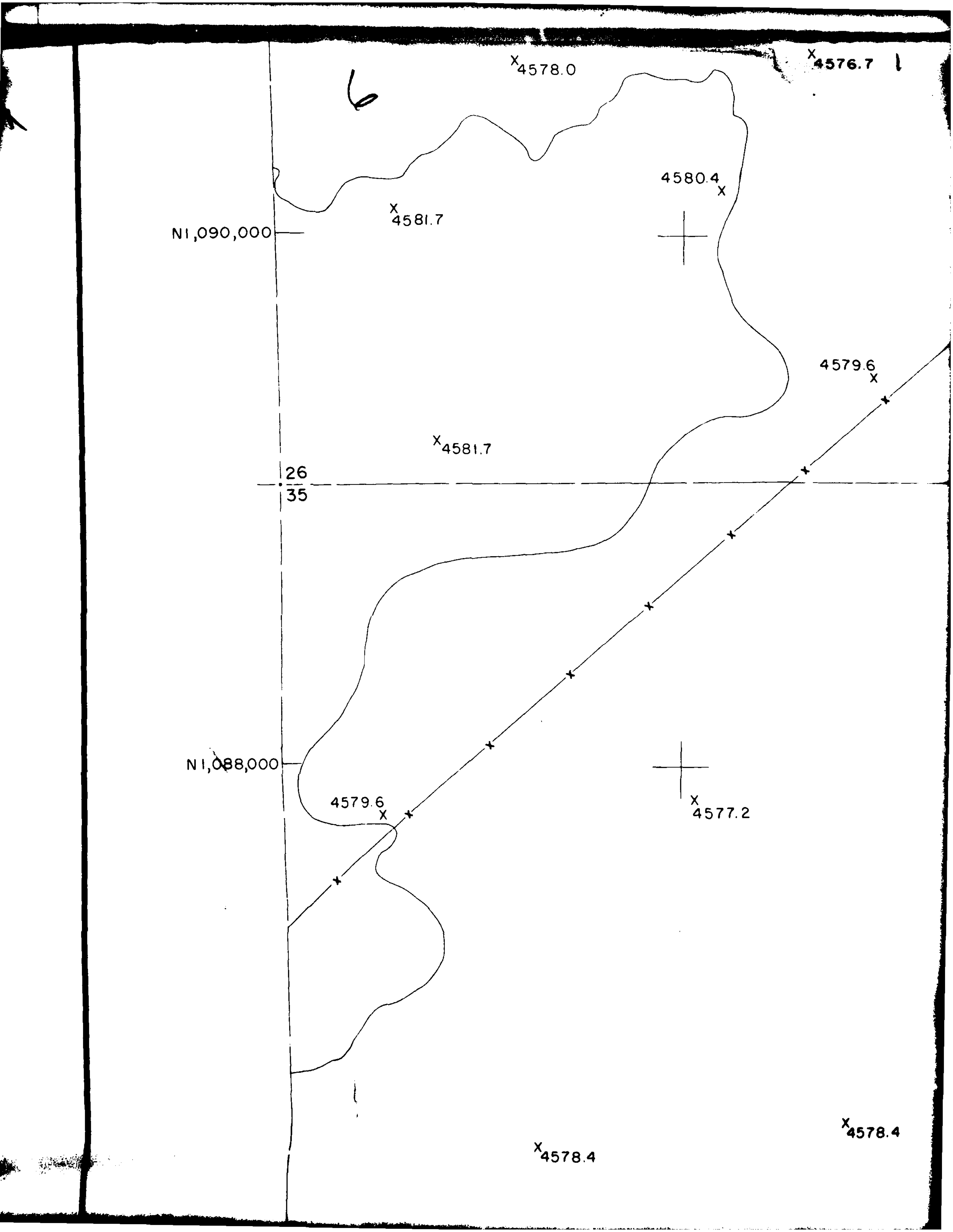
THIS MAP WAS COMPILED BY STEREO-PHOTOGRAMMETRIC METHODS,
UNDER PROJECT NO. 78-280, USING THE KERN PG 2/AT/DC2B
STEREO SYSTEM FROM AEP[illegible] PHOTOGRAPHY DATED SEPT. & OCT. 1978

BASIS OF COORDINATES:
NEVADA STATE PLANE SYSTEM, ZONE: E

BASIS OF ELEVATION: MEAN SEA LEVEL

SHEET INDEX





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4578.0
4576.7
1
4580.4
4581.7
N1,090,000
4579.6
4581.7
26
35
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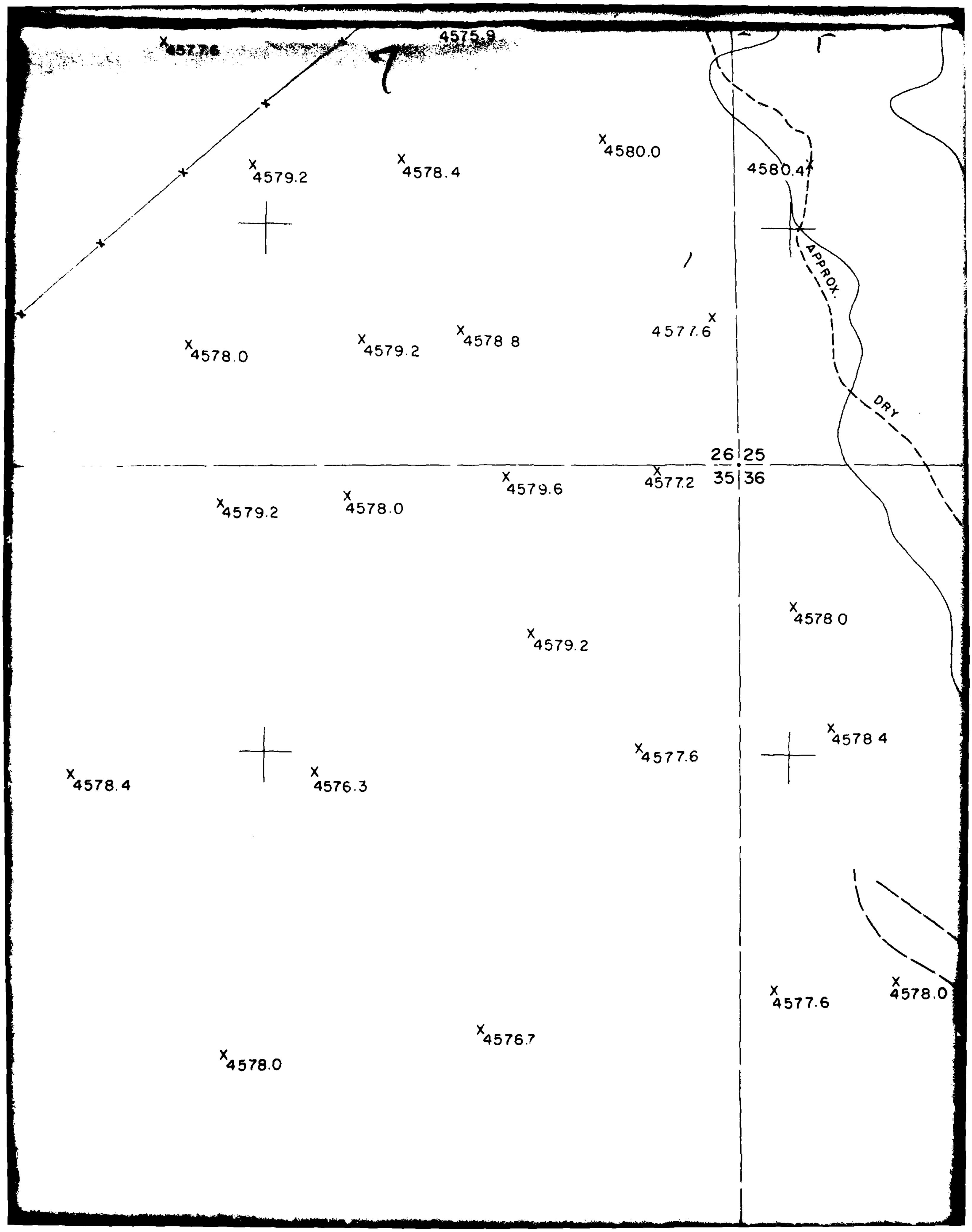
4578.4
4578.4



4575.9
4579.2
4578.4
4580.0
4580.4
APPROX.
4578.0
4579.2
4578.8
4577.6
DRY
26 25
35 36
4579.2
4578.0
4579.6
4577.2
4578.0
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4578.4
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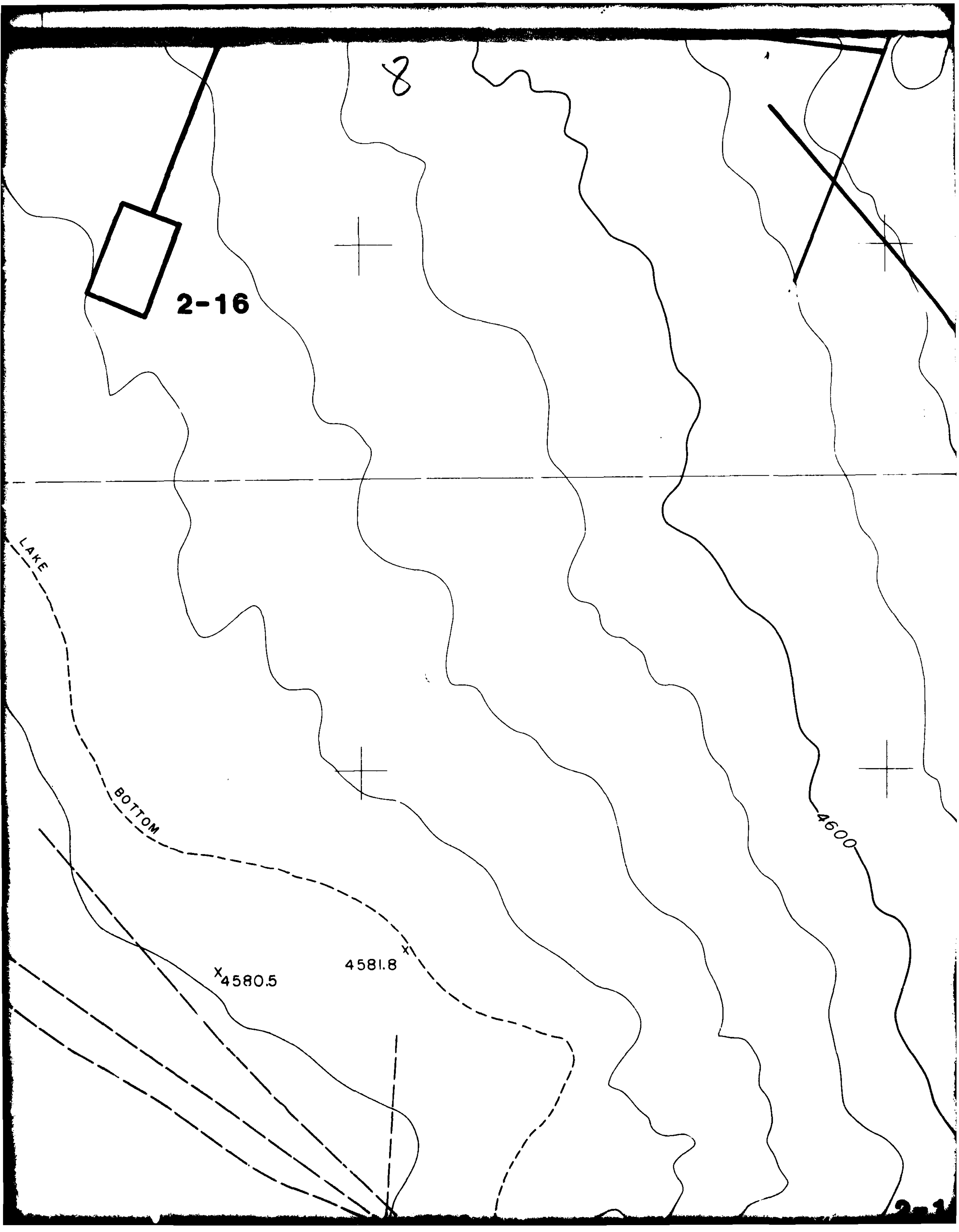
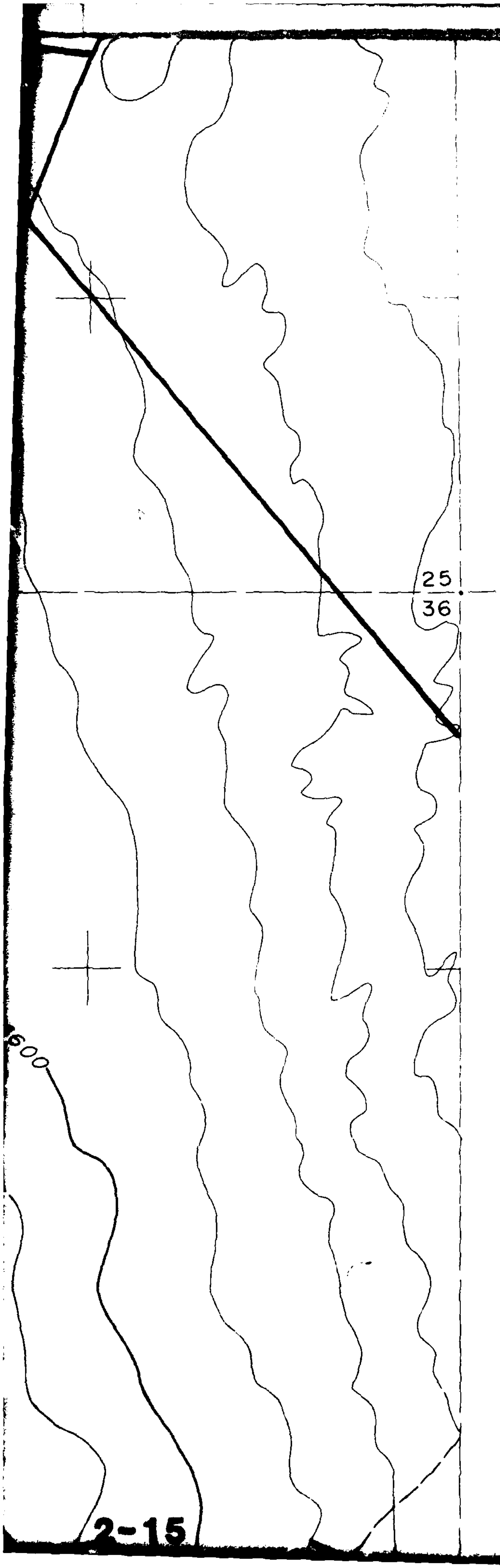
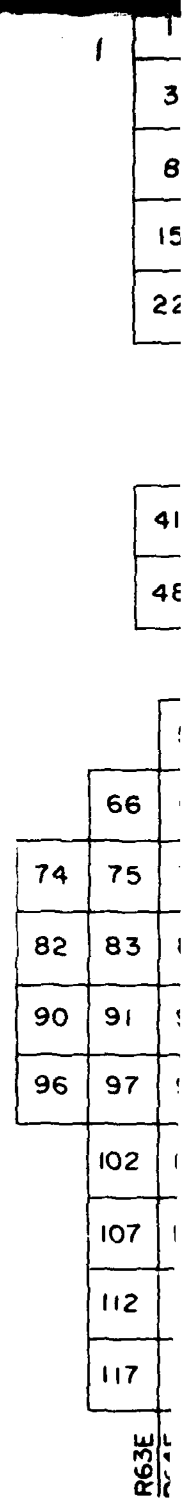
4578.0


8
2-16
LAKE
BOTTOM
4600
4580.5
4581.8

9





● = FOUND 3 1/
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LAND MANA

◐ = FOUND 3 1/
U S DEPART
LAND MANA

⊙ = NOT SEARC

△ = USGS TRIA

= PROJECTED

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UNCLASSIFIED E-TR-58-VOL-1 NL

5 of 5

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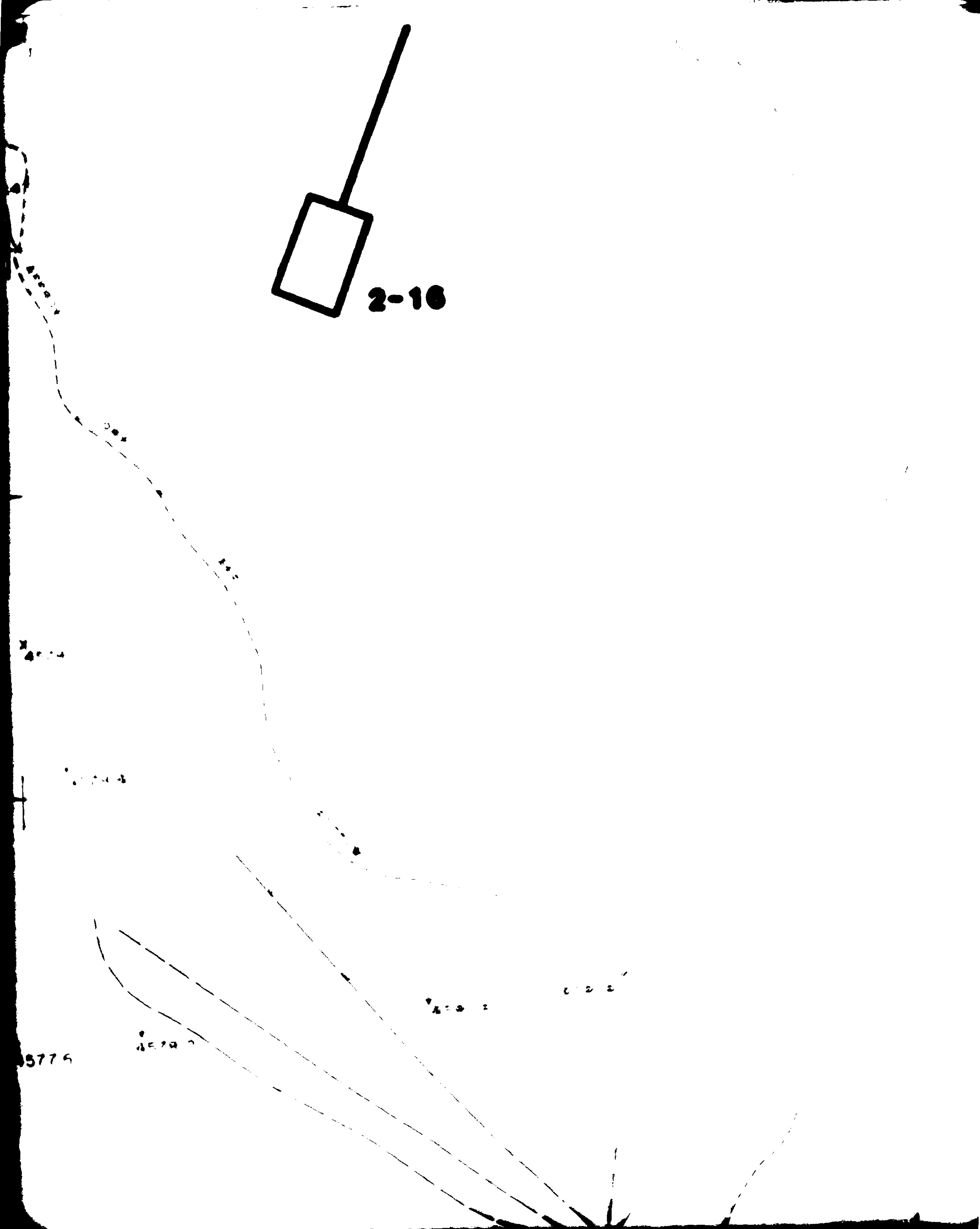
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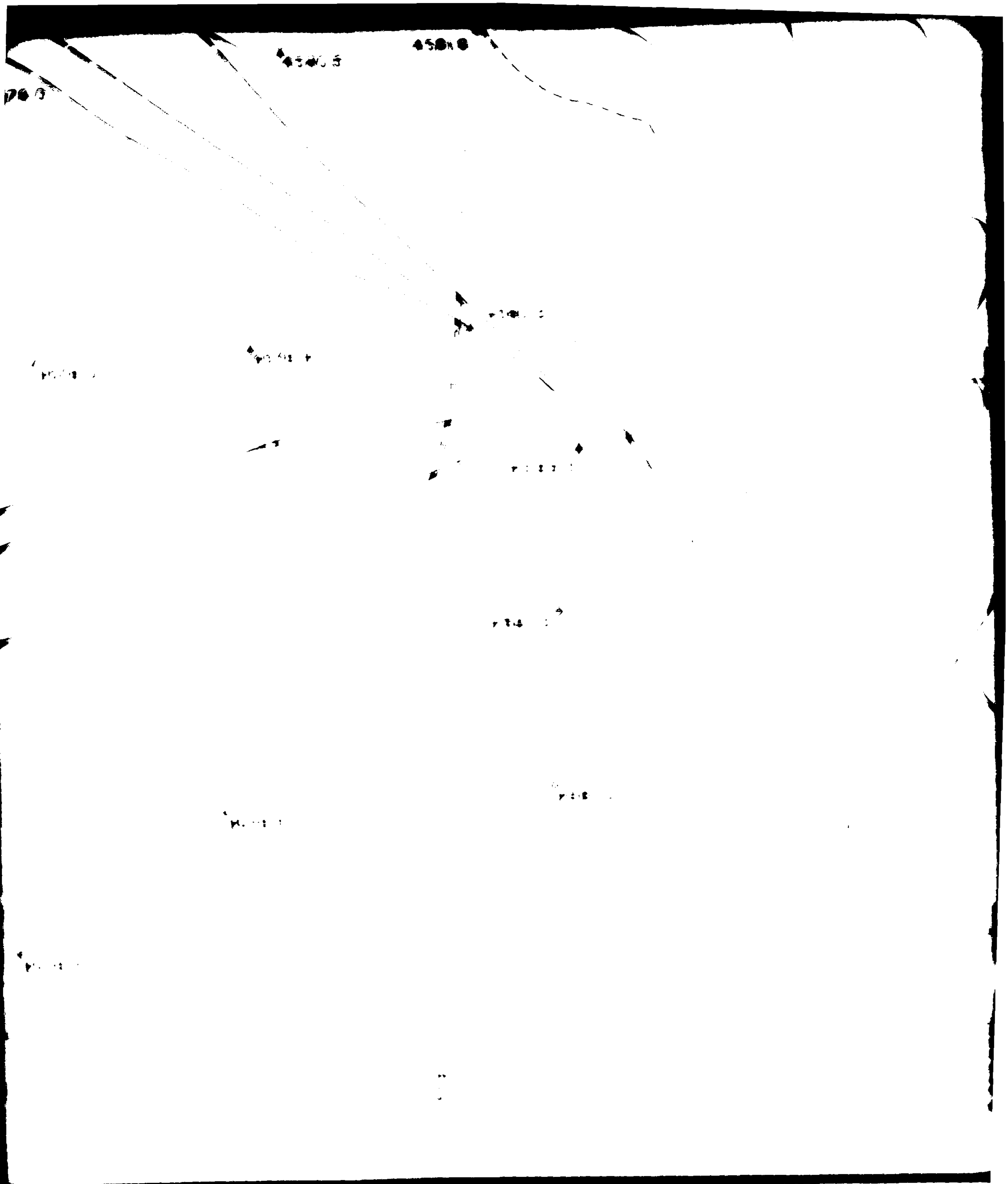
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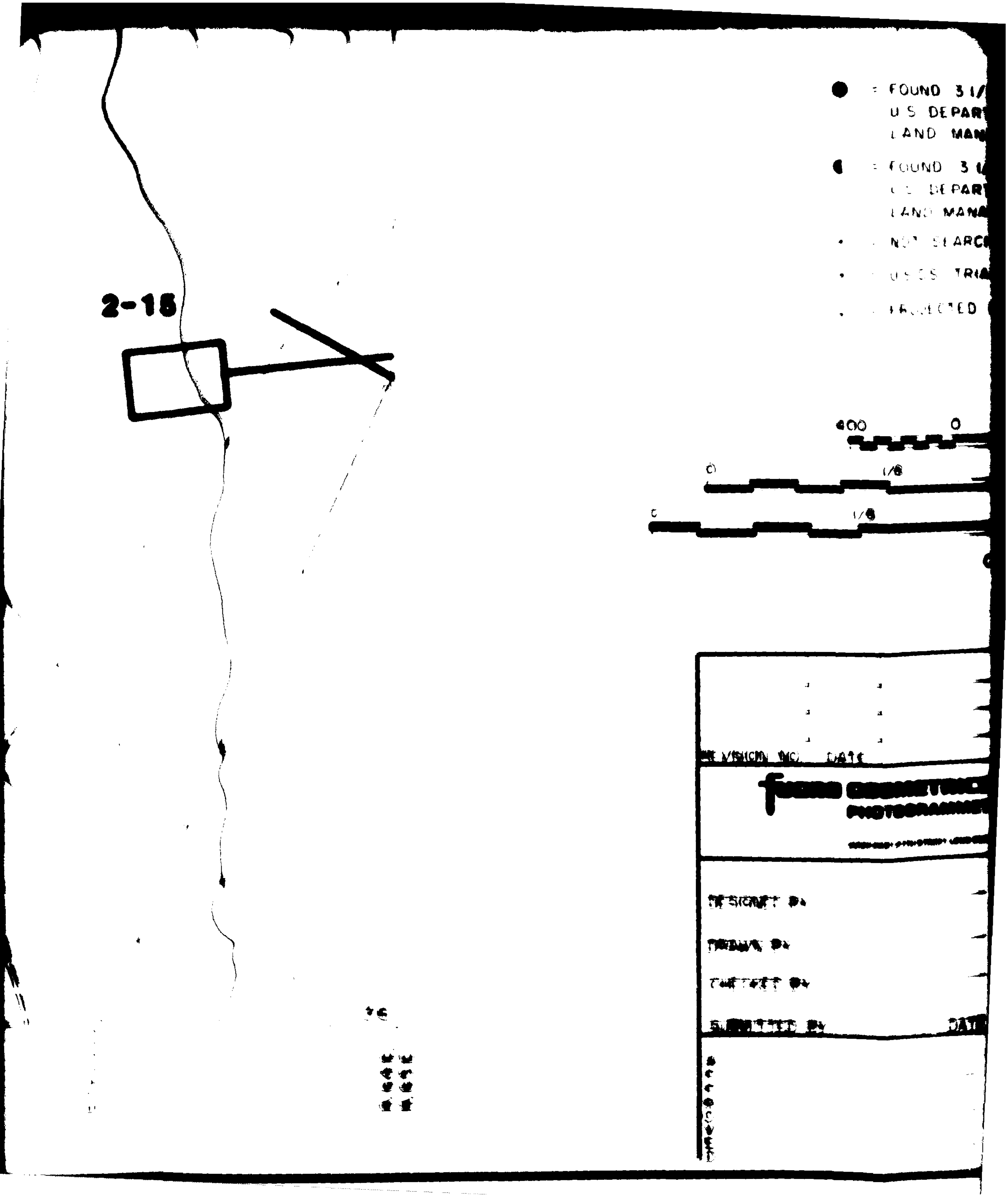

= FOUND 3 1/
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LAND MAN
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DRAWN BY
SUBMITTED BY
DATE
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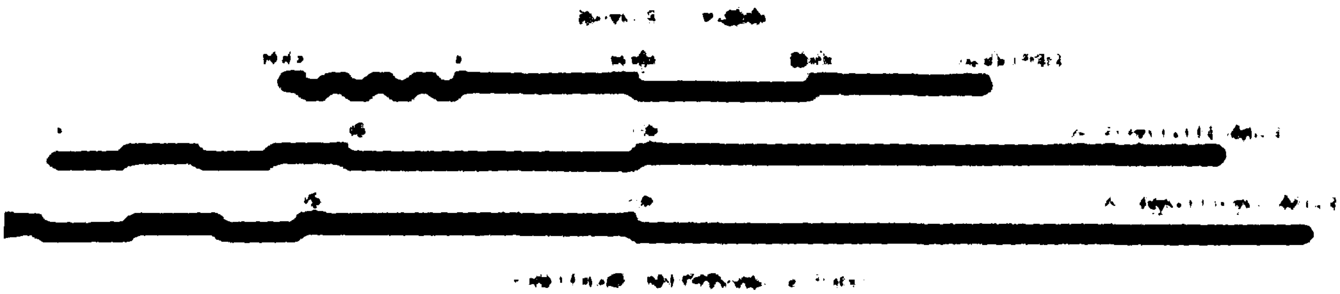

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